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Pathology in the New Medical Curriculum: What has replaced the Subject Courses?

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In line with the UK General Medical Council recommendations, the traditional, taught curriculum at Liverpool was replaced from 1996 by a new one using problem-based learning (PBL) as its principal method of information transfer. There is integration of clinical and preclinical studies, coupled with a reduction in the factual knowledge content and the disappearance of identifiable separate subject courses. Learning is now student-centred. This requires a new approach to the acquisition of pathology knowledge. 1. Pathology is included in all relevant PBL case scenarios by pathology representation on module planning and review committees. 2. Special study modules (SSMs) allow students to observe the practice of pathology including surgical and autopsy work, carry out a detailed study and write a dissertation. Career selectives are provided for individual students in the final year. 3. Clinicopathological (CPC) teaching meetings are held, with the discussion of case examples, clinicians and students contributing. 4. Assessments include the input of appropriate pathology content, integrated with other subjects. 5. A pathology teaching website is provided, containing images, notes, self-assessment questions, handouts, timetables and information. Although the 1996 intake have not yet completed their studies, the results of in-course assessments have been encouraging. The response to the pathology SSMs has been very positive, and the level of presentations and dissertations reached is of a high standard. With the disappearance of a separate subject course in pathology, the subject is being learned by other routes, and the students will complete their undergraduate course with a sound basis for proceeding with their further studies. (Pathology Oncology Research Vol 6, No 2, 149–154, 2000)

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Introduction

In 1993, the UK General Medical Council (GMC) recommended changes to the content, emphasis and method of delivery of the undergraduate curriculum. As long ago as 1876, Thomas Huxley, in an address on university education, had recognised that the burden of knowledge placed on medical students was far too heavy, and that the system favoured cramming of facts rather than sound learning. This is quoted in the introduction to the UK General Medical Council's 1993 booklet "Tomorrow's Doctors".[5] the authors note that similar concerns were expressed in recommendations published nearly a century later, in 1957, 1967 and 1980. The booklet set out ways in which medical education should be improved.

Those affecting pathology teaching may be briefly summarised as follows:

The level of factual knowledge should be reduced, perhaps by an overall figure of 33%. Students should now learn by self-education,[10] using a system-based core curriculum which includes both scientific and clinical material. Modern educational methods should be used wherever appropriate, with computer-aided learning expected to play an important part.[6] Special study modules have an important role of providing in-depth study of a smaller field for interested students. Supervision and feedback, including from assessments, have an important place in the learning process.

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More general features, not especially specific to pathology learning, but expected in the overall curriculum, include:

The development of attitudes and skills, including communications skills and clinical methods, appropriate for a 'junior' doctor.[9] Public Health Medicine and Primary Care Medicine both are to play an important role in the new curriculum, with the students exposed to these disciplines much earlier in the course than previously.

Key proposals at Liverpool:

Following extensive discussions and planning meetings, the proposed changes to the undergraduate medical curriculum at the University of Liverpool were summarised in an internal 1995 document prepared by the University Medical Education Unit. The key proposals could be summarised as:

- The integration of basic and clinical science
- The integration of community and hospital care
- Reduction of didactic teaching
- Increase in small group and independent learning[1,4,7,8]
- Encouraging an enquiring and problem-solving approach
- Retaining the best features of the previous curriculum
- Developing an assessment system suitable for the new curriculum.

Old course / curriculum at Liverpool:

Prior to 1996, the medical course of five years (fifteen terms) total duration was divided into two phases:

- preclinical, lasting 5 terms and terminating with the 2nd MB ChB examination in pathology, physiology and anatomy, and
- clinical, lasting 10 further terms culminating in the 3rd MB ChB examination.

Pathological sciences were examined as a separate part of 3rd MB ChB, but at the end of the ninth term overall, i.e. after three complete years of study.

Pathology teaching in the 'old' curriculum (pre-1996) was typical of traditional United Kingdom medical curricula: comprising separate general pathology and systemic pathology courses *(Table 1).*

The systemic pathology teaching was full-time during the 13 weeks of block teaching. The syllabus was examined in 3rd MB ChB part I at the end of term 9, the examination assessing the five 'Clinical Pathology' Subjects together with Pharmacology.

Assessment in both examinations was by written papers of essay and multiple choice questionnaire type, with oral examinations for selected candidates. In the 3rd MB ChB Pathological Sciences examination, an additional paper was included, based on image and data interpretation, and in extended matching items format.

Table 1. **Outline of pathology teaching in the 'old' curriculum**

1. A general pathology course in terms, 4–5 consisting of 30 lectures and 5 large-group tutorials (24 students in a group), covering the broad headings of:
   Cellular injury and death, necrosis and infarction
   Congenital and genetic diseases
   Acute and chronic inflammation
   Degenerative diseases
   Neoplasia
   and examined by a set of pathology papers in 2nd MB at the end of term 5
2. A systemic pathology course in terms 6–9 consisting of 7 blocks lasting a total of 13 weeks:
   43 lectures and 5 revision sessions, with 6 tutorials and 6 tutor contact sessions.
3. Separate but concurrent courses were given in:
   Haematology,
   Clinical Chemistry,
   Medical Microbiology
   Immunology,
   Pharmacology.

The aim of the pathology element of the curriculum was to give the students a thorough grounding in the principles (and some of the details) of pathology as a basis for the understanding of disease and therefore the rational practice of medicine.

Although typical of traditional curricula of the time, this schedule would no longer be regarded as ideal. Our own observations and discussions with students indicated that, while they started the preclinical course full of enthusiasm, by their second year, about the time they started the general pathology course, some told us they felt overloaded with theoretical and factual detail, and wished to progress sooner to clinical studies. Because the general pathology course predated the start of clinical attachments and visiting patients on the wards, students sometimes later commented that found it hard to see the relevance and importance of what they were being taught at that stage, in the absence of this correlation with clinical cases. The systemic pathology course, interspersed with medical and surgical clinical attachments, was better (and more quickly) appreciated as its relevance soon became obvious. Students would see patients with clinical conditions about whose pathological aspects they were currently learning.

Methods

University of Liverpool Medical School and the new curriculum

Implementation of the GMC proposals by UK medical schools has been enthusiastic but the timetable and degree of change has varied between schools. The University of

Liverpool has been something of a pioneer in this respect, with a complete and rapid transition to the new system. The preclinical / clinical divide has been abolished, subject courses have disappeared and the information content of the curriculum has been reduced, all in line with GMC recommendations. Public Health Medicine has been included at a much earlier stage in the curriculum than before and now plays a substantial part in every module scenario.

The new curriculum has three phases

- The first (year one) introduces the scientific basis of medical practice with emphasis on normal structure and function, (principally physiology and anatomy) at a basic level. Common diseases are included at an elementary level as a peg on which to hang the background studies
- The second phase (years 2–4) covers human life from conception to old age, again with reference to common diseases, with integrated clinical experience.
- The third phase consists of intensive clinical experience on an 'apprentice' basis.

How has this affected pathology?

It is clearly a matter of great concern that, in the drive to reduce the knowledge base and make learning objectives student-set, that pathology knowledge should not be disregarded or reduced to the point where the students lack real understanding of pathophysiological processes in disease. This would distinctly hamper their progress and probably eventually their practice. The importance of pathology in medicine is obvious to its practitioners and to regular users of pathology services which includes almost all doctors and other health care staff in clinical practice. A graphic illustration of this is provided by the striking prevalence of pathology-based subjects in the syllabi of the professional examinations for medicine, surgery and other, smaller, specialties. Pathologists would be able to answer much, many possible more than two-thirds, of these questions from their knowledge of their ***own*** specialty. Clearly the subject has been, and remains, an important basis for the scientific practice of medicine. Many clinicians who have spent some time in training in a pathology attachment, have confirmed the later value of this training in their own field.

What to discard and what to include?

Aiming for a reduction of about one-third in information content would lead to concentration on the common diseases and their understanding to a reasonable depth. Rarities can be left until later, and great detail is not required at the undergraduate level: we are not trying to train practising histopathologists at this stage; that is a matter for postgraduate training programmes. The establishment of a core curriculum, aiming at coverage by all students, and optional extra experience for interested students, is a central feature.

Experience suggests that a basic knowledge of general pathology concepts: cellular injury, inflammation, necrosis and infarction, degenerative disease and ageing, neoplasia – is required. This syllabus is a basis for understanding systemic pathology concepts. In the ***systemic*** pathology syllabus, a knowledge of the basis of individual diseases, organised on a system basis, is required. This will be confined to the commoner diseases likely to be encountered in everyday practice as seen by undergraduates. Broadly speaking these will be covered in PBL[2,12] module scenarios (see below). These are short histories of hypothetical patients, including symptoms, signs and results of investigations, carefully designed to stimulate students to think of all relevant aspects of the problem, which will give a structured and logical framework for incorporating the pathology (amongst other) knowledge.

Review of the 'old' pre-1996 pathology syllabus revealed some material of a more detailed nature which could now be omitted from the undergraduate core curriculum: this had already been stratified (as to its degree of importance) in the student syllabus formerly issued at the beginning of pathological studies. The more detailed study of individual diseases and aspects can be left for the special study modules (SSMs, see below). Only students who are interested in the specific areas covered will encounter this.

Pathology knowledge in the new curriculum is ensured by incorporating it into the various components of the course, both at the planning stage and during delivery. New material of importance and relevance is incorporated as its significance becomes established.

PBL Modules

These are two-week projects covered over three tutorial sessions, each of ninety minutes, in small-group sessions[1,4,7,8] with a tutor present. Up to seven students participate. In the first year, these sessions constitute a considerable proportion of the students' learning time but this decreases as they progress through the curriculum. The tutor is not required to be expert in the subject, nor necessarily medically qualified. His/her role is to guide the students and assess progress with reference to the Faculty learning objectives. The tutor also acts as group facilitator to aid in smooth running of this study method.

Examples of PBL module titles in the first year include: Chest pain, Alcohol, Failure to thrive, Sudden onset of weakness

Each module is supplied with one or more scenarios. These are brief histories of imaginary patients and their families, and include history, symptoms, signs, accounts of visits to the General Practitioner or Hospital, with

investigations, treatment and follow-up as appropriate. The scenarios are carefully tailored to suggest to students relevant areas of study for the current module problem. The students research the given scenarios under the general headings of:

- Structure and function
- Population perspectives
- Individuals, Groups and Society
- Professional Values and Personal Development

and 'brainstorm' the scenario problems to generate leads for further study. They set their own learning objectives, under guidance (if necessary) from the tutor.

PBL Module Planning

During the formulation of the module learning objectives for the 1996 curriculum, extensive interdisciplinary meetings were required. Pathology input was required for the great majority of modules. Pathology is required for understanding the ***structure and function*** element of the clinical problem or disease featured in each module, but may also be involved in the ***population perspective*** (public health) heading and, on occasion, the ***individuals, groups and society*** heading. The appropriate elements are included for each with an overall plan for eventually covering all subject areas which the students will need to understand. They do, however, have to discover this for themselves by the process of formulating, and completing, learning objectives: Faculty's recommended learning objectives remain hidden from the students although available to the tutors. Several modules may involve a broad subject area such as inflammation: this is seen as a positive benefit as the students can revisit their knowledge, increasing the depth each time. This deepening also happens in subsequent years of the curriculum.

Have lectures totally disappeared? Not quite: large group teaching sessions (now known as plenaries) take place mainly in the first year and do not exceed five per week. They are aimed at scene-setting or background only and are not intended to be a course of factual instruction.

Special Study Modules (SSMs)

These are aimed at increasing the depth of knowledge in specific areas of interest to the student. An appreciation of research methods and data handling can also be gained. There is time to read about a small subject area in great detail, regarded as a positive educational feature. Students currently have a choice of about twenty-five different attachments, including three in the Pathology Department. They have the opportunity to pursue a subject in great depth and must produce a written dissertation, which is assessed (marked), and counts towards overall course completion. Students also give a short presentation on their work to staff members at the end of pathology module. Six SSMs are timetabled over the first four years, five of four weeks and one of twenty-one days at one day per week (five months total duration).

The Pathology SSMs comprise:

- A 'follow the Pathologist' module, observing and studying the everyday practice of the discipline, including surgical pathology and autopsies. Two cases are selected for detailed study. Students also attend working meetings with clinicians.
- A laboratory-based module on cancer research
- A module related to paediatric pathology
- Long modules related to audit and laboratory work projects
- Related attachments are selectives, taken by individual students in the final year, and comprising three career experience attachments each lasting seven weeks. These will be offered in the pathology department (among others) and will gave a flavour of the life of a practising pathologist to encourage interest in a career in pathology.

Clinicopathological Conferences (CPCs)

These are currently given during the second year, with at least one during each of the relevant PBL modules. The content is related to the current module and aimed specifically at integrating pathology with clinical features of history, symptoms and signs, diagnostic tests and investigations. The CPCs are organised and run by the Pathology Department, with the help of invited clinicians.

An appropriate clinician, generally a physician or surgeon, will present the clinical aspects of several cases chosen to illustrate the theme: radiology, clinical pathology and histopathology are integrated as appropriate, presented by staff from these Departments. As these sessions are moderated and run by the Pathology Department, they present an opportunity to discuss differential diagnoses and show the findings in related conditions, thus widening the learning opportunities. Students are questioned on the cases and encouraged to participate. Patients may be requested to attend: self-selected students are then invited to interview them and take a history.

These sessions generally last between two and three hours, with intermissions, and are well-received by students, a regular cadre of whom attend each week. They represent one of the few remaining occasions on which students learn directly, although still in an interactive way, in a large group.

Information Technology (IT) resources

The University is equipped with networked personal computers of a high specification, grouped in computing centres and available for student use. Central printing

facilities are available to students and there is good access to library and on-line databases via the world-wide web. Medical Faculty has established a virtual resource centre on the University web server for students' use. This is available also off-campus, e.g. at home, or at more distant hospitals where students are temporarily attached, via a dial-up network system. Pathology has a large component on this website, with numerous macroscopic and microscopic pictures, self-teaching and self-assessment facilities related to the modules. Appropriate notes and 'handouts' are also included in electronic form. Students are encouraged to contribute to the development of this facility, for example during long SSMs which may be devoted to web development of teaching materials. To see an example of a web poster site, please point your browser at: http://www.liv.ac.uk/pathology/educat/poster/example.htm

The materials are an adjunct to other sources of information and students are encouraged to access them during study for PBL modules.

Assessments

Students receive both formative (previously known as 'mock') and summative (formal) assessments, in first year, early part of third year and end of fourth year. These are multidisciplinary, with no single-subject papers used.

The formats of assessment questions include:

- short answer,
- multiple choice questionnaire,
- extended matching items,
- objective structured clinical and video-based exams.

Pathology input into these papers is to provide a bank of questions from which the examiners can select, and to provide an examiner to assist in setting papers and in marking. Questions are intentionally multidisciplinary, and the amount of pathology input increases through the sets of exams, to play a significant part in fourth year exams, in keeping with the change of emphasis as students progress through the new curriculum.

Results and Discussion

How far have we managed to preserve the core pathology knowledge needed for the practice of medicine?

The preservation of the core knowledge component, and its imparting to new generations of students, are clearly of great importance. The core has been preserved in the PBL module learning objectives, which are pointed to and (usually) reached via the scenarios, and should be learned by all students in the course of their modules in the first four years of the curriculum. In addition, the 20% who are attached to the pathology department for SSMs will acquire much more detailed knowledge of the subject. Because these modules are subject to free student choice, the more interested student will apply and therefore benefit more from these attachments due to greater enthusiasm. Much more material can be outlined or revised in the CPCs, with the added benefit that it is immediately placed in its clinical context.

What lessons can be learned so far?

One refreshing observation has been that many students, now that pathology is no longer compulsory, nevertheless want to study it. The SSMs are heavily oversubscribed and have in consequence to be allocated by ballot. The CPCs are well attended with a large regular audience of second-year students, and individual students have expressed enthusiasm for more pathology teaching/learning opportunities. Concerning the delivery, we have had to concentrate on the really essential core information to impart this in the time available. This provides an introductory basis for the students, in keeping with the philosophy of the new curriculum.

Are there any other or better methods that might be used?

A pathological resource centre is under consideration and planning. This would allow students to access materials directly: images, microscopy, preserved specimens, posters, publications and self-test materials, and would be an adjunct to the virtual resources available on-line.

What co-operation with other medical schools might be envisaged ?

With the integration of the English health regions, more co-operation with neighbouring medical schools is envisaged. This will enable the pooling of resources for pathology teaching and particularly for the development of new resource materials. This is already happening at a post-graduate level. Software and images will be developed jointly: eventually there may be some convergence of module scenarios and content.

What future developments would be desirable and / or appropriate?

- The continuing development and expansion of the information technology facility, with more equipment, images, more questions, and a series of on-line cases, is planned.
- The pathological core knowledge will become more integrated with other subjects and therefore securely based as a relevant area in students' perceptions.
- More time to expose students to pathology learning opportunities is desirable.
- A pathology teaching resources centre as described above...

Conclusions

Pathology is essential to the logical and scientific practice of medicine, and lends rationality to understanding disease behaviour and treatment. To ensure that students have an adequate grounding in this subject in the new curriculum, it has been necessary to re-think how we teach it, or, now more precisely, how the students learn it. It should be natural for them to think: „Why does this happen? Oh, yes, that's a consequence of chronic inflammation." for example. Pathology makes disease logical and understandable, the first requirement for diagnosis and instituting treatment.

Didactic teaching has disappeared, but a gaining of ***understanding*** can be achieved by the processes outlined. The first set of fourth year exams is in 2000, and the first students will qualify in 2001. Time will tell, but there is reason to believe the doctors of the future will have developed an analytical and systematic approach and thus be equipped to face changing problems.[11,13] There has indeed been a 'quiet revolution' in medical education. The future challenge will be to follow this through to postgraduate education.[3]

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