Pathology Education

PATHOLOGY EDUCATION

30th Anniversary Edition

In This Issue:

Volume 25

Number 2

Summer 2000
Winter 2001

Summer 2000 Indianapolis & Winter 2001 St. George's University, Grenada

Volume 25, Number 2

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Subscription rates $10.00 per year or $6.00 per single copy. Reduced rates are available if ordered in bulk. Subscription rates include all postage and handling.

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INSTRUCTIONS FOR AUTHORS

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PE considers four types of papers from contributors: *Major Articles, Special Reports, Commentaries and Letters to the Editor. Major Articles* include fully documented reports on major innovative ideas and studies pertaining to pathology education and/or medical education in general. *Special Reports* include presentations of new ideas and technological advances in pathology and medical education, reports on limited studies, and preliminary data on short or long-term projects. *Commentaries* are concise articles that present the views of authors on certain issues that are discussed during GRIPE meetings or are presented in *PE*. *Letters to the Editor* are short articles that express the individual feelings and ideas of the authors pertaining to any topic presented in *PE*.

General Guidelines

All manuscripts must be submitted on diskette (preferably MS Word) along with one hard copy on 8-1/2 by 11 inch paper with consecutively numbered pages. Margins should be at least one inch on all sides. Manuscript titles must not run more than two journal lines, and all articles should contain sub-headings of two or three words each. Footnotes should be kept to a minimum and should be no more than two or three lines in length. When references are needed, they should be restricted to pertinent papers, listed in order of citation, numbered in sequence, and cited by superscript numerals within the text. The title page should include a) concise title, b) first name, middle initial and last name of each author and his or her highest degree, c) institutional affiliation of each author, and d) acknowledgements. The number of listed authors is limited to seven. Authors should follow the specific guidelines given below on style format. If there are any additional questions, the editor-in-chief should be contacted before the manuscript is submitted. Each article should include the title, the author's name, address, telephone number, and e-mail.

Human Subjects

Manuscripts submitted to *Pathology Education* that have used student-based information or any other human subjects must have had prior IRB approval prior to their publication. This has to be clearly stated in the manuscript.

Specific Guidelines on Format of Major Articles

Major Articles are not limited to any particular number of pages, but must be accompanied by an abstract of no more than 200 words. Each *Major Article* must also be accompanied by at least three references. In general, the manuscript should adhere to the following format: *Abstract, Introduction, Materials and/or Methods/Results and/or Discussion, Summary and/or Conclusion and References*. When listing each journal reference, include, in order: author (last name and

initials), title, journal abbreviation, volume number, inclusive page numbers and year; book references should also include editors, edition, publisher and place of publication. Reference for journal abbreviations is the *Index Medicus*. Tables should be numbered with Arabic numerals and titled; figures should be numbered with Arabic numerals and accompanied by legends. Topics for *Major Articles* may include: data of research studies in any area of pathology education, and data of educational studies that involve in-depth work with new technologies and that have a direct bearing on the implementation, augmentation, and evaluation of pathology education.

Guidelines on Format of Special Reports

When writing *Special Reports*, it is not necessary to follow a specific format or follow stringent guidelines essential to the publication of *Major Articles*. *Special Reports* should, however, contain sub-headings of two or three words each and be referenced as above. As with the *Major Articles*, tables should be numbered with Roman numerals and titled, figures should be numbered with Arabic numerals and accompanied by legends. Topics for *Special Reports* may include: reports of short presentations made during GRIPE meetings, education and administration policies pertaining to pathology education, problems encountered by students or faculty, federal regulations and their effects of pathology education, new electronic and computer technologies, and noteworthy student and faculty experiences.

Guidelines for Commentaries and Letters to the Editor

There are no specific guidelines for writing *Commentaries* and *Letters to the Editor*. The style and approach of each individual author is welcomed and encouraged. However, as with the above two types of articles, these articles should also include the title, the author's name, address, and telephone number. *Commentaries* are short articles that address any topic related to pathology education or medical education in general. Usually these articles include comments, reflections, and recommendations of the authors regarding past and future GRIPE activities and projects. *Letters to the Editor* are fairly short articles (no more than two pages) that address key topics that were specifically discussed in previous issues of *PE* or topics that the author would like to see in a future issue of *PE*. *Letters to the Editor* may include "Testimonials" of authors that describe the role of *PE* or the GRIPE organization in helping their departments to implement improved programs in pathology education. In short, *Commentaries* and *Letters to the Editor* are two sections of *PE* that provide authors the opportunity to freely express their views on anything that is related to pathology education.

Concluding Comments

Authors should review the above guidelines and format before preparing and submitting their manuscripts for publication in *PE*. Special requirements apply to supplements and two-part articles; the editor-in-chief should be consulted before any lengthy material is submitted. Since the purpose of GRIPE and *PE* is to quickly disseminate current and new ideas in all areas of pathology education, *PE* does not impose any restrictions of the number of papers to be submitted by any given author. It welcomes the submission of thought-provoking and noteworthy articles from all pathology educators, GRIPE members and non-members alike. The articles could address any aspect of pathology education both at the undergraduate and resident levels. All manuscripts accepted for publication are subject to editing and condensation by the editorial staff. When edited copies are sent to the authors for review, they should be returned within 24 hours after receipt. It is up to the discretion of the individual author to make reprints available and these are the responsibility of the author.

EDITOR'S NOTES

It is my goal to reduce the time for publishing articles from twelve months to six months. To accomplish this, this double issue of Pathology Education contains articles from the meetings held last summer at IUPUI in Indianapolis and this past January at St. George's University School of Medicine in Grenada, West Indies. I ask every author to submit his or her manuscript as soon as possible after the meeting, preferably at or before, to insure timely review and publication within the allotted six months.

Regina Kreisle's article entitled "Human Subjects Issues and Educational Research: When Students Become Human Subjects" published in the Winter 1999 (Philadelphia, PA) issue of Pathology Education stirred up a great deal of conversation among GRIPE members conducting educational research using student information and data. Each of you is reminded that Pathology Education now requires all contributors to address the issue of local Institutional Review Board approval in carrying out studies involving students as defined by local IRB requirements. This policy is in line with the submission requirements of other journals with regards to documentation of assurances when using human subjects or animals in research. For most institutions, this will require IRB approval even for exempt studies. You should also be aware of the fact that the government's office that oversees use of human subjects in research has been changed to the Office for Human Research Protections (OHRP http://ohrp.osophs.dhhs.gov/). As a reminder, OHRP is now requiring that all NIH investigators undergo a certification process that documents that they have undergone training on the regulations and responsibilities involved with the use of human subjects.

There are several take home messages from the articles in this issue of Pathology Education. "How can we attract our medical students into our pathology residency programs?" This is a question being asked by every program director and pathology course director in the U.S. and Canada. As a group, we need to identify and design targeted recruitment strategies directed at the dynamic changes in student career choices that are reported to occur in medical school. Recruitment needs to begin in the second year pathology course. This course is often our only shot at introducing pathology as a career field and providing students with credible role models of what a pathologist is capable of. In order to accomplish this, course directors must be open to change. The goal is to increase student awareness of the importance of pathology and its clinical relevance.

Chuck Hitchcock, M.D., Ph.D.

LETTER FROM THE PRESIDENT

It is with mixed feelings that I write this, my last President's Letter. On one hand, it will be somewhat of a relief not to have to come up with a profound-sounding letter for the next issue of the Journal. And as Patsy Lill noted, in her final President's Letter several years ago, it is nice to only have to worry about one more meeting going well (as you read this, you may well already know whether or not it did). However, along with the responsibility of leading GRIPE these past two years has come not only a great deal of satisfaction over what we continue to accomplish, but also an opportunity to work so very closely with so many wonderful people. The best part of it all is that I will continue to have the privilege to do so, as one of the "elder statesman" that all of our Past Presidents have become ("elder", of course, referring to wisdom, not age, gals and guys).

As always, my deepest gratitude goes to the Executive Committee, the Central Office, and you all, the Members of GRIPE, for all the efforts you have put forth, despite your busy schedules, to bring us to the point at which are today. We have gone truly international, our ties with other medical education groups continue to strengthen, and we remain the pioneer force in undergraduate pathology education. I was fortunate to have inherited a potent and dynamic organization from my predecessor, Jim Newland, and I am more than confident that we will continue to be in excellent hands under the leadership of Regina Kreisle, Sebastian Alston, and their successors, as well as the continued magnificent work of those who keep us officers on the right course, namely John Holliman and Deb Redwine in the Central Office.

Thanks everybody; it's been a great run.

Roger W. Geiss, M.D.

THE TOM KENT AWARD
FOR
EXCELLENCE IN PATHOLOGY EDUCATION

Selection Criteria

The emphasis will be on contributions to Pathology education, which will be defined as broadly as possible, and include both undergraduate and graduate programs. The award will recognize the broader category of "education," rather than just presentation skills, and should recognize a "lifetime" of contributions, rather than something done at any one point in time. The awardee's contribution to education should be widely recognized, and not simply gratitude for "services to GRIPE." ANYONE who has made a major contribution to Pathology education will be eligible, whether or not they are GRIPE members.

Selection Process

Nominations will be annually solicited from the GRIPE membership as a whole. Candidates should be nominated by a minimum of three GRIPE members, each in separate institutions. Two additional letters of support should also be submitted. Nominations will come from GRIPE members only, although supporting letters may be accepted from anyone. The selection will be made by an "Award Committee" consisting of the four immediate past presidents of GRIPE. For a nominee to be selected by the Committee, a minimum of three votes is needed from among the Committee members. It is not expected that the Award must be presented every year.

Recruitment into Pathology Residency Programs: Can Our Undergraduate Pathology Programs Affect the Outcomes?

Bertha M. Garcia, M.D.

INTRODUCTION

In the past few years there has been a steady and relentless decline in the number of U.S. and Canadian medical graduates entering residency programs in laboratory medicine. The dynamics behind these changes are not well understood, however, this has continued to occur in a time where many undergraduate pathology course coordinators have made many attempts to expose medical students to the discipline by offering summer fellowships, electives and clerkships. However, some medical schools however seem to be more successful than others in encouraging their undergraduate medical students to the laboratory disciplines.

The Problem in the U.S.

A workforce survey conducted in the U.S. was presented at the meeting of the Association of Pathology Chairs and Residency Program Directors in July, 2000 by Dr. Bruce Alexander to show the top ten medical schools producing medical students entering a pathology residency during the previous five years (Table 1) (1). In the same study, when factors influencing career choices were investigated, it was found that although 80 percent of the senior medical students consider specialty choice as most important, 88 percent felt that they lacked the appropriate data for decision making. In addition, 50 percent of the medical students delayed their decision regarding specialty choice until their last year in medical school. In the past few years, the numbers of U.S. Medical Graduates matching to PGY-1 pathology positions in the U.S. has declined from approximately 275 in 1991 to just over 100 in 1999. A parallel increase of matches by foreign medical graduates to PGY-1 pathology positions has also occurred, but this increase does not compensate fully for the loss from U.S. medical graduates pathway.

The Problem in Canada

In Canada, the situation is much worse than in the U.S. for three main reasons. First, there has been a steady loss of laboratory medicine residency positions across the country. Some of these positions were lost as a result of general reductions of the residency positions across Canada. Most positions were lost because they remained unfilled after the Canadian Match. A strat-

TABLE 1

Top Ten Medical Schools Producing Medical Students Entering Pathology Residency Programs (1)

University	Number of Students	Average/Year
Medical University of South Carolina	56	11.2
University of Minnesota	51	10.2
University of Texas HSC - San Antonio	45	9.0
University of Iowa	44	8.8
University of Chicago	44	8.8
Wayne State University	43	8.6
University of Texas - Houston	40	8.0
Louisiana State University - New Orleans	40	8.0
Indiana University School of Medicine	38	7.8
Thomas Jefferson University	35	7.0

egy in the past few years in most Post-Graduate Dean's offices has been to transfer any unfilled positions to other specialties in demand, especially primary care specialties. This has caused an acute shortage of laboratory medicine slots for the Canadian Match. Second, in Canada, foreign medical graduates are not allowed to enter the initial match, and only a very small pool of foreign medical graduates are allowed to enter the second iteration of the match (for all specialties). For example, in the 1993 match there were 389 international medical graduates in the Canadian match, the number in the 2000 match was 5. Third, there is currently a serious shortage of physicians in Canada, which is believed to be at least partly due to a 10 percent reduction of total medical school slots introduced in 1991. Finally, Canada, a traditionally primary care driven country, has always had difficulties recruiting into some specialties, including laboratory medicine.

The chronic shortage of laboratory physicians has now reached critical levels in Canada. A study conducted by the Royal College of Physicians and Surgeons of Canada, recommended a ratio of Laboratory Physicians per million of population of 52 (2). The current national average is 35. In Ontario the average is 31. The decline in the numbers of laboratory physicians in Canada amounts to an 11 percent loss of the total laboratory medicine professional workforce since 1993. The situation is compounded by what appears to be no short-term solutions on the horizon since approximately 1/3 of all laboratory physicians in Canada are 55-years-old or older. The shortage of Laboratory Medicine physicians has been acknowledged nationally and provincially by the media (3) and by special reports in the province of Ontario (4,5). Most pathologists believe that the current shortage of laboratory physicians has potential negative effects on the quality of clinical work and on their academic performance, in a time of increasing demands especially for tissue pathologists. Most believe that the fewer the pathologists the fewer the residents, a trend that makes the specialty even less attractive (6). There is no doubt that there is a significant compromise in the quality of laboratory medicine services. A recent report from the Ontario Laboratory Medicine Proficiency testing program documented the negative effects on quality of the current situation (7).

It is estimated that there are currently no less than 200 laboratory medicine positions available in Canada and many more are not advertised. All this is taking place in a background of a significant shortage of physicians in Ontario (8). It is expected that the Province of Ontario will need 150 new pathologists over the next 5 years.

FACTORS INFLUENCING CAREER CHOICES OF OUR MEDICAL STUDENTS

In a recent review of pathology as a career, Marshall tried to explain the lack of interest by medical students in a career that he sees, as a non-pathologist, to be extremely attractive (9). He described the many attractions of the discipline and highlighted what he considered the popular misconceptions about the pathological specialties. He began his article with a quote: "Pathology? No thanks! Stuck away in a lab all day, the stink of formaldehyde, other doctor's dead patients...". From Marshall's perspective, the greatest drawback of a career in pathology and laboratory medicine was its "back room" image.

When I performed a literature search to explore medical students' career choices, I found a total of 812 references between the years 1970-2000. Of those, only 2 papers addressed directly the question for laboratory medicine, the majority of the references addressed the question from the point of view of other specialties such as primary care, anesthesia, and radiology. It is of interest that all those specialties have suffered from recruitment problems in the recent past.

One of the most comprehensive studies was the one of Kassebaum and Szenas (10). These authors described the findings of the 1993 Association of American Medical Colleges (AAMC) Medical School Grad-

uation Questionnaire. The study grouped the specialties into: generalists, medical specialists, surgical specialists and support specialties (including pathology/laboratory medicine). This study explored the possible influence of 36 factors on the specialty career choice of the graduating class. The 36 factors were arranged into 10 groups: personal interests/skills, helping/social responsibility, intellectual opportunities, patient contact, encouragement/role models, lifestyle attributes, clerkships/courses, leadership and prestige, residency issues and economic issues. The students were asked to rate the 36 factors influencing their specialty of choice (sole specialty choice or first choice of up to three alternatives). Students who failed to rate a factor (2%) were not included in the computation of the mean rating for that particular item. For each factor, the students had 5 choices: no influence, minor influence, moderate influence, strong influence, and major influence.

The top seven factors rated as having strong to major influence were ones related to patients, to the content and quality of the specialty, and to the perceived fit of the graduate's personality to the specialty. The factors that had moderate influence on their specialty choices included: type of patients, examples of physicians in the specialty, encouragement from practicing physicians, their medical school clerkship (clinical) experience in the area, lifestyle, economic issues, and the opportunity to exercise social responsibility. The factors with limited to no influence related to the residency included: length of the residency, lack of overcrowding, opportunities for research, minimum uncertainties in diagnosis/therapy, prestige, and authority within the medical profession. It is of interest that those students that had changed their minds rated the most significant factors influencing their decision (rejection of a specialty) as being: lifestyle issues, type of patients, and consistent-with-personality issues. Discouragement by faculty was considered to have had no influence, a significant finding when compared with other studies.

Switching Career Interests

A more recent study of the AAMC Medical School Graduation Questionnaire compared results from a 1995 questionnaire and 1992 data (11). A comparison study of the specialty choices of both years was performed. Furthermore, the authors had access to the results of the Matriculating Student Questionnaire, which was given to the same cohort of students at the beginning of their medical education career. By comparing their responses on the graduating questionnaire to a questionnaire given to the same students at time of matriculation (Matriculating Student Questionnaire), it was possible to determine the extent to which graduates' specialty choices represented early interests that were retained or interests acquired later during medical school (switching). For the 1995 graduates who entered medical school with the intention to pursue family practice careers, up to half retained that interest, and twice that number acquired an interest in family practice later. For general internal medicine and general pediatrics, the interests of the 1995 matriculants largely were lost and the ultimate selection of these fields by graduating students was based on interests arising later in medical school. This study did not explore what factors were at play during the school year when some specialties became rejected while others were favored. The authors, however, speculated that the generalist epiphany seemed to be the result of greater emphasis on primary care in medical school curricula, changes in health care delivery, and a better view of the future of primary care as a career.

A very revealing report by Kassebaum and Szenas (12) used data from the AAMC matriculating Student Questionnaire and the Medical School Graduation Questionnaire. They ascertained how closely the specialty or sub-specialty choices of the 1991 and 1994 graduates of U.S. medical schools matched the preferences they had declared when they started medical school, the extent to which these students strongly considered and then rejected choices that arose during medical school, and the graduation choices of the substantial number of

students in both cohorts who were undecided about their careers when they entered medical school. Approximately 80 percent of the graduates in both classes rejected the specialty intentions they had declared when they began medical school. Matriculation interests in the generalist specialties - family medicine, general pediatrics, and general internal medicine - were more enduring for the 1994 graduates, while interests in the medical, surgical, and support (laboratory medicine) specialties were less so. The highest percentage of students whose original specialty intentions endured at graduation in 1994 were obstetrics-gynecology (35.8%), psychiatry (34%), and family medicine (33.6%). The groups with the least enduring intentions included general internal medicine (8%), thoracic surgery (4.9%), and general surgery (4%). Pathology and laboratory medicine had an enduring rate of 27.9 percent in 1994, up from 20 percent in 1991. Large percentages of the 1991 and 1994 cohorts were undecided about their careers at matriculation (20.8% and 26.2% respectively), and nearly the same proportions remained undecided at graduation. The decisions of the originally undecided from the 1991 cohort were divided almost equally between medical specialties, generalist specialties, surgical specialties, support specialties (laboratory medicine), and remaining undecided. In contrast, those undecided from the 1994 cohort choose preferentially one of the generalist specialties by the time of graduation and a smaller fraction of the students who had been undecided at matriculation were attracted to the medical and support specialties such as laboratory medicine (16.5%). A higher number of students in the 1994 cohort (26%) remained undecided.

On the graduation questionnaire, the senior students were asked if they had strongly considered a specialty or sub-specialty career that arose during medical school but that they later rejected in favor of the choice declared at graduation. Of all the 1994 respondents, 47.8 percent had renounced interests that arose during medical school (and were distinct from any matriculation intentions). The highest levels of these passing interests were for general surgery (6.2%) and the lowest for thoracic surgery (0.3%). It is of interest that in this analysis, pathology and laboratory medicine were found to be the 7th lowest with a 1.3 percent passing interest. More significantly, when these values where compared with the percentages of students who stuck with their matriculation interests or with the interests they gained later in medical school, as many students lost interest as gained interest in family medicine, general pediatrics, and general internal medicine. These specialities were net losers while pathology and laboratory medicine along with the other support specialties (such as radiology) were net gainers, but not by much. These findings suggested the presence of significant dynamic changes occurring during the medical school years, changes that if well identified and understood, could be used to develop and implement active targeted recruitment strategies into individual disciplines which are currently facing critical manpower problems.

In an unpublished April 1999 report from CARMS (Canadian Residency Matching Service), the graduating students were asked to complete a survey indicating their current career choices as well as to reflect on their career choices upon matriculation 4 years before. A comparison of both responses from the 1149 Canadian medical graduates entering the 1999 match indicated that the rate of rejection of their early career interests is even higher (90%) than the American schools. Therefore, we can reasonably assume that similar dynamic changes are also occurring in our Canadian medical schools.

What Happens During Medical School?

Large reviews of the literature which examined the determinants of medical students' specialty choices (13) have shown some emerging themes. Students tend to enter medical school with a preference for primary care, but their preference diminishes over time especially after clinical clerkships. Older students, women students, and married students, as well as those with low-income expectations and those who are

interested in diverse patients and health problems are more likely to choose primary care. Likewise, students for whom prestige, use of high technology, and participation in surgery are not of paramount importance tend toward primary care. Among the many curricular experiences studied, only a required family medicine clerkship and longitudinal primary experiences were associated with primary care choice. The culture of the institution, resulting in part from its mission and funding sources, may explain why public schools that have large representations of primary care faculty are among those consistently producing high numbers of students who enter primary care specialties.

Negative Role Models or "Badmouthing"

A smaller study from the west coast by Mutha et al. (14) tried to identify previously unrecognized factors influencing medical students' career choices and to better characterize the effects of educational experiences, role models, and educational debt on career decisions. This retrospective study was based on focus groups discussions of 52 third and fourth year medical students from three California medical schools. The focus group discussions were audio-taped and qualitatively analyzed using content analysis. One of the most interesting findings of this study was the role of negative role models. The student's assessments of interpersonal interactions and career satisfaction of negative role models were particularly influential in closing doors to certain fields. The reported attributes of these negative role models included: difficult personalities, perceived lack of camaraderie, professional dissatisfaction, and disheartening physician-patient interactions. There are several limitations to this study, most particularly its size. They also made no attempt to identify which specialties lost more due to the factors identified. The eventual career choices of all students were however listed, and none had selected laboratory medicine as a career.

Although the role of negative role models has been alluded to by some of the previous publications, there has been very little published research as to what constitutes or characterizes a negative role model. However, there has been an increasing interest in the role of "badmouthing" or negative comments on medical students' career choices. This phenomenon has been frequently called the "hidden curriculum" and refers to the superficial and demeaning comments that students hear about particular career choices.

A study by Hunt et al. (15) explored the frequency and effect of "badmouthing" on career choice with the hypothesis that it is more frequently heard about primary care disciplines, but has relatively little influence on actual career choice. The students heard badmouthing about their career choices most frequently when they selected surgery (91%) and family medicine (87%), and least frequently when they chose pediatrics (57%). Seventeen percent of the students reported altering of their choices based on badmouthing alone. The authors concluded that "badmouthing" during medical school was pervasive across disciplines and an unattractive aspect of the educational experience. They however recognized that badmouthing alone cannot account for the low proportion of graduates choosing primary care careers. These findings complemented a previous study by Hearst et al. (16) who surveyed students who had previously shown an interest in family medicine. In this study, 95 percent of the students had received negative feedback, usually from physicians in other specialties. The types of bashing or badmouthing were categorized and found that comments such as "you can't know everything" (28%) and problems with lifestyles/hours/respect (18%) were the most common while low income (5%) and turf (4%) being the least common. This original study did not study whether or not other disciplines were also being "bashed"; a fact latter shown (15). The authors did not ask the students what effect these comments had on their ultimate career choices. However, they associated the bashing with the fact that eventually only 30 percent of the students who had registered initial intent in family

medicine eventually selected that career. The frequency or impact of badmouthing on laboratory medicine or pathology was not reported in this study.

Effect of Debt

The Canadian and UWO specialty selection trend may soon change as the first medical graduates with debts in excess of $100,000 begin to graduate. Marci and Roberts (17) administered a 19-item questionnaire to second year students at the Harvard Medical School in the years 1995,1996, 1997, and 1998 and showed that debt load had an effect on career choice. In addition to assessing the magnitude of their debt, the students were asked to respond to the following questions, "To what degree will your level of indebtedness have an influence on your choice of specialty?" and "To what degree will your level of indebtedness have an influence on your choice of career path?" The latter question tried to address academic vs. private. The questionnaire also had questions trying to address comfort with the debt and worry about loan repayment. In their study, increasing debt failed to correlate with an increased influence on specialty and career choice at debt levels less than $25,000. Between $25,000 and $75,000 increasing debt did correlate with an increased influence. Interestingly, this correlation was absent beyond $75,000 of debt. Overall, 62 percent of respondents had debt of at least $75,000. The authors concluded that their analysis suggested a large and substantial effect of educational debt on attitudes and prospective future decision making about career choices at the medical student level. In all four classes, respondents with the greater debt burden were significantly less comfortable with their debt, more worried about their debt, and more likely to report an expected influence of their debt on future choice of specialty and career path. In the U.S., over 50 percent of graduating medical students with debt have debts of at least $75,000 with up to 1/3 owing in excess of $100,000 (18).

FUTURE STRATEGIES

In the past 10 years, practically all medical schools in Canada have changed their curricula. Although these changes could be considered, and often are, a threat, they can also be viewed as an opportunity to introduce new curricular experiences in laboratory medicine different than the traditional lecture/lab formats of the past. We know that the old formats do not work; it is now time to try something new.

When we look at the population that we are likely to attract to laboratory medicine, it is of interest that medical students likely to choose laboratory medicine come from all levels of the academic achievement rank within the classes. Rubeck et al. (19) reported that pathology attracted most of its students from two groups - those in the highest group and from the groups nearest the overall mean. This means that we could practically gear our recruitment strategies to the whole class.

Other disciplines have introduced successfully enhanced clinical experiences as a way to influence career choices of medical students. Morrison and Murray (20) reported at least initial success with their initiative particularly with male students. The clerkship "effect" was also described extensively by McLaughlin et al. (21) especially as it referred to family medicine.

Unfortunately, no similar publications were found with regards to enhancement strategies for laboratory medicine. Anecdotally, however, many pathology course directors and residency program directors across North America report some type of initiatives underway with some results. Perhaps the fact that all laboratory medicine positions in Ontario were filled at the first match in 2001 is an indication that some of these strategies are working. There is certainly need for a comprehensive survey of laboratory medicine departments to document what initiatives are being launched and to monitor the outcomes. At our school we were successful at introducing four week elective periods during clerkship in laboratory medicine disciplines. Although the pro-

gram was introduced in 1999, the response rate among the past two classes has been reassuring. Thirteen students so far have chosen this elective, of which four went on to careers in laboratory medicine. The feedback that we have received so far has been positive, but for some of them the elective in clerkship might still come too late for the match. I believe that strategies to influence recruitment in medical school have to start in year one.

Although we offer electives in years 1 and 2, our students are often overwhelmed by a very intense pre-clinical curriculum and find it difficult to spare any time away from their core studies. A strategy that I intend to introduce for the fall of 2002 with the second year class is the ability to obtain up to 30 percent of their final pathology grade by participating in the clinical pathology services of the department. This is now being made possible by the impending consolidation of all pathology services at the university campus including a single city-wide morgue and forensic unit. This initiative has two main objectives: to give them the opportunity to apply their pathology knowledge learned to a clinical situation and to provide them with strong clinical pathology role models. An added attraction of this proposal, the students tell me, is the reduction on the stress levels during examination periods since they would have obtained a significant portion of their grades in another format.

Another initiative that I have launched for this summer is the offering of two summer jobs in the department of pathology for students finishing first or second year. These jobs with competitive salaries are already showing evidence of being extremely attractive to our students, who see the opportunity to get some grounding of their medical learning in a discipline such as laboratory medicine while being able to stay in town and reduce their debt. Finally increased visibility at career fairs, short term research programs, and other short-term electives are also desirable and easily achievable.

A challenge more difficult to tackle will no doubt be the neutralization of possible 'bad-mouthing" within our institution. Although we do not have our own data to support that this is our problem too, we do not have reason to believe that it is otherwise. As a matter of fact, anecdotal evidence to the contrary is plentiful. Students continuously indicate to us that our colleagues often dissuade them from choosing laboratory medicine using apparently well meaning advice such as "you are so good at patient care and in the wards, why would you choose something like laboratory medicine?."

Finally, we need as a specialty to identify clearly to students what are the positive aspects of our specialty including those aspects that have been identified recently by our graduates: lifestyle issues and income potential. I truly believe that we have a tremendous unexplored potential here and it is up to us, laboratory physicians, to utilize it.

REFERENCES

1. Alexander B. Work force and other PRODS surveys, Boulder, Colorado, July 25, 2000.

2. Royal College of Physicians and Surgeons National Specialty Physician Review, Ottawa, 1988.

3. CTV- W5, January 18, 2000.

4. McKendry R. Fact-Finding Commissioner on the scope and nature of physician supply for the Ontario Ministry of Health and Long Term Care, January, 2000. http://www.gov.on.ca/health/english/pub/ministry/mckendry/mckendry.pdf

5. Collins A. Report of the LSR Laboratory Physician/Scientist Working Group. Strategies for more effective use of the laboratory physician scientist resources in Ontario. November, 1997.

6. Treolar M. "Laboratory Medicine in a Downward Spiral". Canadian Association of Pathologists, Professional Affairs Committee Report. July, 2000.

7. Richardson H. Laboratory medicine in Ontario: its downsizing and the consequences on quality. LPTP Newsletter, 268, January 11, 2000. http://www.lptp.on.ca/library/newsletters/ane268.pdf

8. Kralj B. Physician human resources in ontario: A looming crisis. Ontario Medical Review, April, 1999.

9. Marshal W. Career focus "Pathology". Br Med J 1998, 31(7164):S2-7164.

10. Kassebaum DG, Szenas PL. Factors influencing the specialty choices of 1993. medical school graduates.1993.

11. Kassebaum DG, Szenas PL. Specialty intentions of 1995 US medical school graduates and patterns of generalist career choice and decision making. Acad Med, 1995, 70:1152-7.

12. Kassebaum DG, Szenas PL. Medical student's career indecision and specialty rejection: Roads not taken. Acad Med 1995, 70:938-43.

13. Bland CJ, Meurer LN, Maldonado G. Determinants of primary care specialty choice: a non-statistical meta-analysis of the literature. Acad Med 1995, 70:620-41.

14. Mutha S, Takayama JI, O'Neil EH. Insights into medical student's career choices based on third and fourth year student's focus group discussions. Acad Med 1997, 72:635-40.

15. Hunt DD, Scott C, Zhong S, Goldstein E. Frequency and effect of negative comments ("badmouthing") on medical student's career choices. Acad Med 1996, 71:665-9.

16. Hearst N, Shore WB, Hudes ES, French L. Family practice bashing as perceived by students at a university medical center. Fam Pract. 27:366-370, 1995.

17. Marci CD, Roberts TG. The increasing debt of medical students: how much is too much? JAMA. 1998, 280:1879-80.

18. Beran RL, Lawson GE. Medical student financial assistance. JAMA 1998, 280:819-20.

19. Rubeck R F, Witzke DB, Jarecky RK, Nelson B. The relationship between medical students' academic achievement and patterns of initial post graduate placement. Acad Med 1998, 73:794-6.

20. Morrison JM, Murray TS. Career preferences of medical students: influence of a new four-week attachment in general practice. Br J Gen Pract 1996, 46:721-5.

21. McLaughlin MA, Daugherty SR, Rose WH, Goodman LJ. Specialty choice during the clinical years: A prospective study. Acad Med 1993, 68:S55-6

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Recruiting Medical Students into Pathology: A Useful Monologue

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INTRODUCTION

I never waste an opportunity to tell students about the career opportunities in pathology. This is the substance of the monologue that I have, usually one-on-one, with potential candidates for the post sophomore fellowship, for summer fellowships, or for senior electives in pathology.

ADVANTAGES OF PATHOLOGY

"Pathology is the general practice of scientific medicine. Pathologists see the most interesting material of the hospital. They have time to know their families and their kids. They have time to become involved in the community, and can arrange a mix of practice, research, and teaching which is very difficult to achieve for other physicians."

"Every pathologist not only has the opportunity, but also has the responsibility to be an academic. Only a few clinicians of other specialties can hope to achieve academic status outside of a medical school environment, and that is becoming increasingly difficult. The pathologist is recognized as an intellectual leader in the medical community. Indeed that role may be inversely related to the academic stature of the institution. In a university medical center the chairmen of major clinical departments do not regularly need to ask the pathologist for advice on what tests to order or for interpretation of routine tests. In the small hospital the pathologist is often consulted with much greater frequency. The job of the pathologist includes being an innovator and investigator. It is up to the pathologist to introduce new technology to the labs for which he or she is responsible. Even if your hospital is ten years behind the times, it is dependent on the pathologist to investigate development of immunoperoxidase staining, flow cytometry, molecular diagnosis, or modern computer systems."

"Pathology offers greater degrees of freedom of choice, for what you may be doing next week, next year or 40 years from now, than any other discipline in medicine. Imagine that pathologists Y and Z work together in a hospital. Doctor Y has been in charge of the chemistry lab for 10 years and Doctor Z has the same role in hematology. Doctor Y is getting bored and arranges with Doctor Z to switch areas of responsibility. Doctor Y does not have to move, does not lose a day's pay and does not have to worry about the quality of services to the patients because the former expert is still available for consultation and assistance. Doctor Y now has an entirely new challenge."

"The opportunity to change your emphasis from among the many options of pathology provides further degrees of freedom. Choices include anatomic pathology, clinical pathology, research, and administration. Each of these, in turn has further subdivisions. Anatomic pathology includes surgical pathology, cytology, and autopsies. The clinical pathologist may be in charge of all of the diagnostic laboratories in the hospital including, in a list that is not complete: chemistry, hematology, immunology, microbiology, cytogenetics, molecular diagnostics, flow cytometry, electron microscopy, management, and informatics. Each of these broad areas may have multiple branches requiring specialized knowledge and expertise. Research options range from those of a full time dedicated investigator to those that uniquely present themselves to the part time researcher or to the practicing pathologist. The job is never done and the horizons are never closed."

"When I entered pathology we had no trouble recruiting the 2 to 3% of graduating physicians that pathology then needed. When

the rotating internship was ended, recruitment to pathology plummeted; particularly in those schools that no longer even have a formal course in pathology. Medical students and even first year house officers may never get a chance to see what pathologists do as practitioners of medicine. They may have seen the pathologist as teacher and as scientist, but have little notion of how the pathologist practices medicine. Students have to make up their minds about postgraduate training by the end of the junior year, never having had a rotation in pathology. Even if a student has an elective or rotation in the senior year it is usually too late to influence their decision. Therefore, national recruitment to pathology has fallen to about 1 to 1 1/2% of graduates."

"A pathology fellowship or elective in pathology, whether for a summer or for a year, can give you a taste of what a life of freedom might be. I ask for no promises. I never ask, as a condition of the fellowship, whether you are interested in pathology. However, I warn you that if you spend as little as 6 weeks during the summer, there is at least one chance out of ten that you will change your mind about your choice of medical specialty. Of the students who have spent the whole year in the post-sophomore fellowship in pathology at the University of Pittsburgh about 50% have chosen pathology as a career. I recall one student who entered the fellowship saying 'I'm a surgeon.' This was repeatedly proclaimed during the fellowship year. By the end of his first rotation in surgery, he decided that, having had a taste of freedom, he would become a pathologist."

DISADVANTAGES OF PATHOLOGY

Having discussed the advantages and attractiveness of pathology as a career, I always point out the few negative aspects of pathology that the student must be aware of.

"Pathologists are among the very few physicians who cannot support themselves by direct billing of patients. Although pathologists now bill for surgical pathology and for some of the special procedures in cytopathology and clinical pathology, many of the services that we provide do not get billed to individual patients. Families are not charged a professional fee for hospital based autopsies. Although the professional component of many tests from the clinical lab is of the range of 10-15% of cost, it is not cost effective to bill a patient twenty-five cents for one of the common laboratory tests. We may do such tests by the hundreds of thousands. By mutual agreement such services are included in costs recognized by Blue Cross, rather than by Blue Shield, or by Medicare Part A rather than by Medicare Part B. The pathologist must negotiate with the hospital administrator for payment for such services and for laboratory administration and teaching."

"Under our present system, which encourages overspecialization, a young surgeon can go to an overcrowded area, even if they are not needed, and become incorporated into the community. They can do insurance exams, moonlight in emergency departments, or serve as surgical assistants. Eventually they can become established. In contrast, the pathologist is dependent on a departmental chairman, a dean or a hospital administrator who has authorized a staff position. If there is no slot, there is no job."

"Why is there usually a shortage of pathologists? There has always been a shortage of pathologists and even in the current era where everything is shrinking, there were some temporary dislocations. But we are probably less vulnerable than other specialties that are in great oversupply. Only two times, in my career of the last 48 years, have pathologists found it difficult to get jobs. The first was the year that the Disease Related Group (DRG) system for payment of hospitals was introduced. Hospital administrators took immediate advantage of the situation, although the proposed changes in reimbursement applied only to Medicare and Medicaid and were introduced gradually over a 2 or 3 year period. Some hospitals eliminated one pathology slot. Others reneged on promises

to increase the number of positions. Overnight there was an oversupply of pathologists. At that time, none of our American medical school graduates or trainees in university programs were affected. Because of the chronic shortage of pathologists, many small community hospitals had approved residency-training programs in pathology and offered a haven for large numbers of foreign medical graduates. Job opportunities for foreign graduates were the ones temporarily affected by DRGs. Over the subsequent years, most of the small community-hospital based training programs closed and most training is now in large community hospitals and academic medical centers. Although four or five years ago there was another brief period when the pathology job market was tight, we once again are facing a shortage of pathologists. For many years there was a major effort to build new hospitals and to expand existing ones. The need for cost containment led to a marked increase of same-day surgery and reduced length of hospital stays for many medical conditions. This led to a marked decrease in hospital occupancy. Every hospital struggled to survive and many closed one or more wards or floors. As a matter of practical hospital economics, it requires about 4 full-time equivalent positions to staff one hospital bed. When you close, for example a 5-bed ward, you only achieve about half of these savings. It clearly would be in the interest of society to close one 200-bed hospital rather than 8 25-bed wards. Not only would the savings be greater, but also the surviving hospitals, by increasing their occupancy, could achieve break-even or profit status instead of losses. When the national pressure for cost containment became a serious effort, in many cities, all over the country, there were hospital closures. The annual number of newly certified pathologists is of the order 400. Because of hospital closures, many seasoned pathologists entered the job market. Many residents, upon completion of their training, resorted to fellowships. Some residents, early in their training, quit pathology. Medical students, who did not understand the dynamics of the situation, and who did not realize that this was a temporary situation, avoided pathology. Pathology residency programs often had the number of training slots decreased. All of this adds up to the former status quo, that is a shortage of pathologists."

I remind the students that they should not consider pathology unless they know that they have the intellectual equipment.

"A mediocre or poor clinician can make a living, because the public often cannot tell who is a good or bad physician. The pathologist, on the other hand, is dealing primarily with other physicians who can judge the competence of their pathologists. A pathologist must be able to convince his/her clinical colleagues that (s)he is good and that his/her opinion is to be trusted."

POST-SOPHOMORE FELLOWSHIP IN PATHOLOGY

My motive is to give the fellows a taste of what their future might be. The hallmark of the program is freedom. For prospective post-sophomore and summer fellows I make the following points:

"You can select your own program. I don't tell you what to do because I want you to know what it is like to spend your life making your own decisions. However, nothing is ever completely free. I think that in the one-year post-sophomore program every medical student should have a minimum of three months of research and three months experience in the practice of pathology. If you have already had such experiences you do not need to repeat them. Therefore, you can theoretically spend the entire year in research or in practice. Most students will require a minimum of three months each in research and in practice. How you spend the remaining 6 months is up to you. What that will be depends in part upon what you want to do and with whom you want to work."

"The University of Pittsburgh School of Medicine has one of the largest Departments of Pathology in the United States of America. We have over 100 full-time M.D.s and Ph.D.s. We can give you an experience in almost any area that you are interested in. We have liver patholo-

gists, kidney pathologists, heart pathologists, ENT pathologists, perinatal neuropathologists, and more. A similar list could be created for specialty areas of clinical pathology. There is a degree of specialization that is very rare and yet we have broad general people."

"We can offer a wide range of modern technology. You can learn any of the classic disciplines in pathology: surgical pathology, autopsy, cytology, all of the components of the clinical laboratories, electron microscopy, flow cytometry, cytogenetics, tissue culture, or molecular diagnosis. You can focus on an organ or on a problem. For example, you can pick a focus on breast, heart, lung, or cancer immunology. If you are really interested in clinical chemistry or immunology or cytogenetics or microbiology or whatever, you have to make up your mind on your interests. I will help you to find a mentor. Currently the department will support two students with a stipend of $15,000 per year. We also provide a $500.00 allowance for books, dues and travel, and pay the premium on the school health insurance policy."

"A detailed application is more likely to be approved. I am more likely to accept the proposal that describes the proposed project, and identifies a mentor from whom there is already a commitment. Therefore, if you are sincerely interested in applying, I will give you the names of several staff people whose interests match yours. Maybe you have already met somebody that stimulated you to do this or have a particular project. The application that you send to me should outline what it is you propose to do and with whom you propose to work. In the spirit of flexibility, even these plans may be subject to approved change.

"I can promise you that you will enjoy your experiences in pathology. I will keep in touch with you during your post-sophomore fellowship and I encourage you to be free to contact me at any time."

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Applying the Principles of Adult Learning to Medical Education

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ABSTRACT

The application of principles of adult learning to medical education might not seem to be an issue requiring much discussion. However, the limited amount of life experience possessed by the traditional medical student, coupled with the nature of medical education itself, has created a situation in which the principles of adult education may not be universally applicable. Many traditional medical students are not in the position to determine their own educational experiences or to decide for themselves that which is relevant to their future careers. As compared to knowledge gained in more typical adult education experiences, much of what is learned in medical school does not have immediate application. The medical student is frequently more concerned about the attainment of grades than about the acquisition of knowledge. The nature of medical education limits the student's opportunity to test ideas, take risks, or be creative. Finally, because of limited life experience, the medical student not infrequently will have less knowledge to utilize and to share with classmates than is frequently the case in adult learning activities. In medical education, therefore, adult learning principles must be carefully chosen and tailored to fit the student population whom the medical educator is attempting to teach.

INTRODUCTION

Do the principles of adult learning apply to medical education? After all, the overwhelming majority of medical students are adults in the chronological/legal sense, and all have spent a considerable number of years in preparatory education. However, many of these preparatory experiences are so constructed as to limit the amount of so-called life experience on the part of the student prior to entrance into medical school. This fact, combined with the very nature of medical education, has created a situation within which the basic principles of adult education may not be universally applicable. This article will attempt to explore the ways in which this may be so.

DISCUSSION

W.H. Burton has stated that "the learning process proceeds most effectively when the experiences, materials, and desired results are carefully adjusted to the background of the learner" (1). In the case of adult education, the learner is an adult, defined as "one who has reached maturity or legal age" (2). While there is no question that the vast majority of medical students are of legal age, their degree of maturity requires further exploration. Maturity is "the state or quality of having reached full natural growth or development" (3), and there is no question that the overwhelming majority of medical students have achieved full physical growth. However, for educational purposes, we must ask whether or not an individual should be considered "mature" just because her/his epiphyses are closed. The answer is obviously in the negative, requiring an examination of the individual's psychosocial development. This is largely conditioned by the degree of life experience possessed by the individual. While a significant number of medical students have considerable life experiences (so-called "non-traditional learners"), students traditionally enter medical school directly from undergraduate college. One educator referred to young people at this point in their development as "students whose largest problems so far have been passing exams, coping with meddlesome parents, and finding a girl/boyfriend" (Grether B. Personal communication). The "traditional" medical student has spent most or all of his/her life, outside of the home, in various educational environments, from primary and secondary school through undergraduate college. Medical students, in their early twenties,

must be distinguished from those contemporaries, armed only with a high school degree and having spent several years supporting a family, who are enrolled in an adult education course in order to improve a certain skill in their chosen profession. Such a distinction must be considered in the planning of educational methods and experiences.

At this point, it would be useful to examine some of the principles of adult learning in the context of medical education.

Adults Like to Determine Their Own Learning Experiences

How often have we heard our students say, "it's our education?" It has been stated that "true adult learners can figure out what they don't know" (Sharkey F. Personal communication), and that is one of the goals of promoting lifelong learning. But has the traditional medical student arrived at that point in her/his development, at least at the onset of medical school? Is not the teaching of lifelong learning skills one of the major goals of contemporary (competency-based) medical education? If we can agree that the traditional medical student has not yet progressed to the point at which (s)he is a seasoned lifelong learner with a firm grip on her/his educational needs, then it follows that (s)he is not in the same position to determine her/his own educational experiences as is, for example, an automobile mechanic with several years' experience taking an adult education course that will prepare her/him to repair the next generation of internal combustion engines.

A related issue is the fact that the principles of adult learning are most applicable to situations that are purely, or largely, voluntary and while the vast majority of medical students are in medical school because they choose to be, they have (beyond a limited amount of elective time) little or no choice as to the courses in which they enroll. While most students will readily admit to the importance of a strong preclinical background, a significant number view the "taking" of basic science courses to be a chore which they would prefer to avoid. Thus, while medical school itself is voluntary, many of the educational experiences therein are not, and it is within these situations that medical students may behave in a manner more like that of younger students than that of adult learners.

Adults Enjoy Active Educational Experiences

Certainly this statement applies to medical students, and it is important to incorporate active learning experiences into their education. To do this in the clinical years is a straightforward process, and active clinical learning is the type most enjoyed by the majority of students. However, a certain amount of preclinical background is necessary to prepare students for meaningful clinical experiences. While active learning techniques may be effectively utilized in preclinical education, there are also forces at work which seek to make the preclinical experience as uniform as possible among students. Not only faculty members, but frequently students themselves, desire assurance that all students are "getting the same material" in order to prevent any of them from having an advantage, real or perceived, in future activities such as examinations and clinical experiences. The more competition that exists among students in a given institution, the stronger will be these forces. Passive learning activities (such as lectures) are more likely to be seen as providing the students with a uniform education than are active learning activities (such as student-centered small groups or self-study). Such passive learning situations more closely resemble secondary school or undergraduate education than they do adult learning situations.

A related problem in medical schools is the degree to which students are willing to make the effort to obtain an education. Both "teach" and "learn" are active verbs, but we have all had experiences with students who express the belief that the major effort that they should have to put forth consists of the act of paying tuition, and that the rest of their education is up to the faculty. This belief may be viewed as an expres-

sion of the attitude of "entitlement," which has been defined as "a sense of being entitled to attention, care-taking, love, success, income, or other benefits without having to give anything in return" (4). In medical students, entitlement leads to "the notion that knowledge is a 'right' that should be delivered with a minimum of exertion and discomfort on the part of the 'consumer' (4). Parenthetically, the question as to whether or not medical students are truly "consumers" is a salient issue that which has been recently explored in several articles (5,6), to which I refer the interested reader. Regardless, this expectation that others will provide all the necessary education leads to a certain degree of passivity on the part of the student (4). Application of adult learning principles to such students may be of limited effectiveness.

Adults Hate to Have Their Time Wasted

Adults are motivated by an identified need to learn, and are unhappy when they do not recognize that need as applicable to a given educational activity. One of the longstanding laments of the traditional medical student is that much of the information imparted to them, particularly during the basic science years, is not "relevant." Regardless of the validity of that perception on the part of the student, the perception exists nonetheless, and shapes the kind of student to whom the medical educator must relate. The degree of self-motivation seen in adult learners such as the auto mechanic mentioned above is less likely to exist in a student who, rightly or wrongly, does not consider what (s)he is learning to be "relevant." Again, in most medical schools, this perceived lack of relevance is more prevalent in the preclinical than in the clinical years. Efforts at increasing students' awareness of the importance of the basic sciences, such as integration (horizontal as well as vertical) and an increase in clinical exposure during the preclinical years, have been fruitful efforts to address this problem. However, there remains a core of background information which medical students must master before dealing with material that they may perceive as "more relevant." It is in the delivery of instruction in these background areas that educators must be circumspect with regard to considering medical students to be adult learners in the fullest sense of the term.

Adults Want Practical Answers to Problems and Immediate Applicability

For adults, the learning process is more effective when there is immediate application to solving problems and when satisfaction is derived thereby. In the case of medical education, application must be postponed, particularly during the basic science years, thus lowering the level of satisfaction gained. This phenomenon underlies much of the concern on the part of preclinical students regarding the relevance (or lack thereof) of much of their course material, as outlined above. Again, the preclinical phase of medical education may not constitute an adult learning situation in the fullest sense of the term.

Adults are more Interested in the Acquisition of Knowledge than in the Attainment of Grades

Certainly the aforementioned auto mechanic will have little concern for her/his grade, as long as (s)he passes the course. This individual's overriding concern is to learn how to repair the engine. For the medical student, however, the grade earned in a particular course can assume great importance. This is especially true during the basic science years, wherein the grades earned constitute a major determinant of the student's class standing at the time of residency application. Also, the acquisition of knowledge may assume a relatively lower level of importance in basic science courses that do not appear to the student to be "relevant," as noted above. Depending upon the grading system in place at a particular school, the perceived importance of grades may well persist into the clinical years. Certainly students who have a high degree of concern for grades have less in common with many other adult learners than they do with undergraduate or even high school students.

Adult Learning is Facilitated when the Learner has the Opportunity to Test Ideas, Analyze Mistakes, Take Risks, and be Creative

However, it must be asked whether or not contemporary medical education constitutes a situation which affords students such opportunities. As compared to other adult learning situations, medical school tends to be less flexible, in terms of both curriculum and methods of evaluation. Medical students may certainly analyze and learn from their mistakes, but the relative rigidity of the typical medical school curriculum leaves little opportunity for idea-testing, risk-taking, and creativity on the part of the student, particularly in the preclinical years. Also, in a situation in which a student measures her/his success largely on the basis of the quality of evaluations received, there will be some inevitable reluctance on his/her part to take chances and to stray from the prescribed norm. Again, in this area, medical students have less in common with other adult learners than they do with less advanced students.

Adults Learn from Others' Experience, as well as their Own.

As previously noted, most traditional medical students have limited life experience as compared to others of their chronological age. Also, in the competitive environment of medical school there will inevitably be some students who will be reluctant to share their knowledge with their classmates. Finally, a number of nontraditional medical students have spent their years of life experience, at least in part, qualifying for admission into medical school. Such students will tend to possess a perspective that those with less life experience will not have, and will be less likely to take their medical education for granted than will their less experienced classmates. The latter students are more likely to exhibit a sense of "entitlement," as described above, and for these students, many of the principles of adult education may have limited value.

SUMMARY AND CONCLUSION

The issue of whether or not medical students are truly "adult learners" is complex indeed. Because medical students are chronological adults with (some degree of) life experience, many of the principles of adult learning are applicable to them. However, because of the rather unique characteristics of medical students, as compared with their contemporaries in other learning settings, adult learning principles must be carefully chosen and tailored to fit not only the medical student population in general, but also the specific student population whom one is attempting to educate. Such an approach is far preferable to one in which medical students are considered, without question, to be adult learners in every sense of the term. In using a flexible approach, the medical educator is not denigrating the student by implying that (s)he is not an adult, but rather is realistically recognizing her/him as a student to whom the educator has a responsibility to aid in molding her/himself into the finest possible physician, by the most effective educational methods available. It would not be fair for the educator to expect of the traditional medical student the kind of seasoned behavior that (s)he might not be prepared to exhibit.

REFERENCES

1. Burton WH. Phi Delta Kappa.
2. Soukhanov AH (ed.). The American Heritage Dictionary of the English Language (3rd ed.). Boston: Houghton Mifflin Co., 1992, p. 24.
3. Ibid., p. 1111.

4. Dubovsky SL. Coping with entitlement in medical education. N Engl J Med 1986; 315: 1672-4.

5. Albanese M. Students are not customers: a better model for medical education. Acad Med 1999; 74: 1172-86.

6. D'Eon MF, Harris C. If students are not customers, what are they? Acad Med 2000; 75: 1173-7.

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Pathology Curriculum at The St. George's University School of Medicine (SGUSOM)

A Hybrid Model of Clinical Problem Solving Curriculum Development - An Exhilarating Experience Over The Past 3 Years

Bharti Bhusnurmath, M.D. and Shivayogi Bhusnurmath, M.D.

INTRODUCTION

We are faced with the challenge of teaching pathology to medical students in such a way as to form a bridge between traditional basic sciences and clinical medicine. The goal of pathology education is to present pathology so as to facilitate student integration of basic sciences to analyze and solve clinical problems. There is no single path to reach this goal. The path taken by students at St. George's University School of Medicine (SGUSOM), faced with a unique situation, has undergone many changes since St. George's University started off a medical school in the mid 70's.

SGUSOM is international in its nature both in terms of faculty and student intake. The Medical School admits between 250-300 students every six months, the majority of them coming from the United States. The bulk of these students enter the US after completing the basic sciences in the Caribbean, to do their clinical clerkships, residencies, and eventually clinical practice. The students spend the first one and half years in Grenada. During the first year (terms 1 and 2) they study basic science courses that include anatomy, histology, embryology, biochemistry, physiology, neuroscience, ethics, immunology, genetics, and parasitology. In term 3, which lasts 3 weeks, they study behavioral sciences. In the final 4.5 months of their stay in Grenada (Term 4) they study pathology (13.5 credits), microbiology (5 credits), nutrition (1 credit), and clinical skills. There is very little exposure to the hospital patients (2 visits) during this period, although they learn some physical diagnostic skills using simulated patients. Upon completion of their 1.5 years at Grenada, they move on to the nearby island of St. Vincent, where the other campus is located. For a period of 5 months (terms 5 and 6) they go through a combined program of pathophysiology, clinical skills, pharmacology, and therapeutics. The students do more hospital visits at this campus. The students have to pass a Basic Science Comprehensive Examination (BSCE) at this point, using internal and external test items, as well as pass Part 1 of the USMLE. They then do two years clinical clerkships in various hospitals in the US and the UK that are affiliated with SGUSOM. They have to pass the Part II of the USMLE and CSA to be eligible for residency matching in the US medical schools.

A few years prior to the authors joining the school in 1996, the pathology course was reduced from a yearlong course to 4.5 months without any attempt made to reduce course content. Students complained of long hours of route memorization. A departmental review that highlighted the course's problems led to our modification of the pathology course curriculum. We went through a series of modifications every term and have presently arrived at a system that can deliver the most desirable fruits within our limitations. This article intends to overview the baseline situation that existed before, educational principles targeted, the sequential changes introduced, and analyze the present situation. It is difficult to objectively evaluate the effects of the changes brought about but subjective results are to be presented.

THE PROBLEM - STATUS OF THE PATHOLOGY COURSE IN 1996

In 1991-92, the yearlong pathology course was condensed to a 4.5 months course. However, the contents of the course (13.5 credits) had remained the same. The students considered it the most difficult course

for a wide variety of reasons, many of which are not unique to SGUSOM. The most often cited problems included:

1. The large number of credit hours could jeopardize a student's GPA
2. Unfamiliarity with pathology
3. Students, familiar with memorization, were not prepared for pathology that involved understanding new terminology, analysis, concept development and problem solving
4. Information overload. The faculty tried to cover as many diseases as possible in the lectures. There was insufficient time to cover the volumes of material, including 1600 lab images, originally designed for a one-year course. There were 2 lectures of one hour each followed by 2-hour labs each day. The faculty thus spent 6 - 8 contact hours on most days of the week. Pathology was viewed as a killer course for both the students and the faculty
5. Lack of clinical relevance due to a lack of exposure to patients or hospitals. The very nature of the school and its geographic location precluded any integrated teaching or systems approach with other clinical courses like medicine and surgery. It made the job difficult for both students and faculty
6. Disproportionate faculty/student ratio. A total of just 3 to 4 professors taught the course to 250 students. The students found it difficult to get their problems resolved from the Professors because of the sheer numbers
7. Inadequate exams. The examinations tended to test minute details from the text and were not clinically oriented. Clinical vignettes were lacking
8. The lectures were from the textbook and failed to emphasize the clinical relevance of the material through the use of clinical vignettes
9. Many students were unfamiliar with the use of glass slides, and required individual attention to adequately understand their content. In addition to breaking and disappearing slides, testing with glass slides posed a major problem when one student moved the stage during the exam resulting in all the subsequent students getting it wrong
10. The students worried if their learning was on par with the students in the U.S. Medical schools
11. The professors were busy most of the time with students seeking individual appointments to seek clarifications
12. There were no activities to interact/ integrate with other Basic Sciences courses

In conclusion, pathology was taught and tested as another science based course with a lot of facts to be memorized. Many students hated the course, studied for fear of failing and most achieved poor scores.

THE SOLUTION – NEW PRIORITIES

In January 1998 one of the authors (SB) was given the course directorship with a mandate to address the above listed problems. It was felt that it was too difficult to change a well-established course completely overnight. Hence some priorities were established and modifications were incorporated to the course step by step each term.

The first three priorities were to: 1) change the examination pattern, 2) reduce course content, and 3) teach clinical relevance and use clinical vignettes. Implementation of these priorities was integrated. We constantly asked ourselves, "will he/she be a dangerous clinician if he/she does not know this?" We used the answer to decide on which concepts to test and to eliminate.

Change the Examination Pattern

Student study habits are driven by examinations. We first changed 10% of traditional 'memory' based to clinical vignette based items. This required modified lectures, labs, and handouts. The proportion of clinical vignette based test items was increased to about 25% in the next exam. The trend continued over the next three years to where presently almost all the test items are clinically based. In addition, approximately 40% of the total 450 test items are based on images. Students felt

reassured by the fact that they were being prepared for the USMLE exams.

Reduce Course Content

The authors felt that it was better to teach less and make sure that the students mastered it, rather than teach them everything possible and have them fail to grasp the essentials. We undertook several steps to accomplish this.

The lectures and lab sessions were reduced to bring the course credit hours to 10 from 13.5. The number of diseases covered in the lectures was reduced to include only the most important/common or prototype diseases. Emphasis was placed on preventable diseases. For each of the diseases and organ systems, emphasis was placed on clinical signs, symptoms, and relevant investigations, apart from traditional pathology concepts of etiology, pathogenesis and structural changes. It was explained to the students that rare and uncommon diseases would not be covered and that they could read about them if necessity arose during their clinical career.

Lab sessions were reduced appropriately. The images were reduced gradually from 1600 in 1996 to about 400 presently. It is the authors' belief that medical students do not need to study more than 100 images of common diseases to be good clinicians. The images were digitized and posted on the students' web site. More weight has been given to gross images than to microscopic images. Only those microscopic images that were deemed essential to understand the pathogenesis of a disease were retained. In the present day world of medicine, hardly any physician is required to study histopathology slides under the microscope to make a diagnosis. The students would learn it anyway if they opted to become pathologists. Kodachromes replaced equivalent microscopic slides. The use of microscope slides for study and testing was discontinued. However, we made them optional for those who wanted to review them.

Teach Clinical Relevance and Use Clinical Vignettes

Students wanted to know the clinical relevance of what they were learning. To accomplish this we modified both the lectures and the labs. The lectures were modified so as to highlight clinical emphasis. We used the labs to teach students how to think in clinical terms. We felt that the only way to achieve this was to make the students practice it as a part of the labs. The approach to the study of lab images was changed. The students were told to treat each image as a patient. Now they had to follow certain steps for each image.
These included:

1. Describe the image. Identify what tissue it is (if possible, citing reasons). Identify how it differs from normal (gross and microscopic structural changes). Based on these observations, make some scientific conclusions about the nature of the disease process
2. Discover the etiology and pathogenesis of this disease (using lecture material and textbook). Explain what functional alterations would have been produced in this patient as a result of the structural changes observed (clinical symptoms and signs)
3. Derive any relevant investigations that would help you to confirm the diagnosis or rule out related diagnosis
4. Determine what would be the course of the disease including important complications
5. The students were advised to make a table for each image highlighting etiology, pathogenesis, gross and microscopic changes, clinical signs and symptoms, investigations, course including complications. The students were informed that the lab exams would test one of these aspects and not merely recalling what the diagnosis was on the image

Simple clinical vignettes of 150 - 300 words each were introduced as a part of the lab activities. The first batch had about 20 vignettes. We kept adding about 20 - 30 each term. Presently there are about 140

clinical vignettes through the course. The characteristics of the vignette include:

1. Locally generated, simple in language to avoid confusing data
2. Linked to the lecture topics of the morning
3. Images from the lab, textbook and selected ones from the prescribed pathology atlas were tagged to the vignettes
4. Each vignette was followed by 6 - 8 simple questions that generated a revision of etiology, pathogenesis, pathologic changes, clinical features, investigations and course of the disease. Not all of these were included in questions for each vignette but the group of vignettes for the day together ensured a revision of all the most basic principles
5. When needed, links to biochemistry, immunology, and physiology were added

These three prioritized modifications were successfully implemented over the past three years. Additional modifications have been introduced that have contributed to the success of the course. They include introduction of group activities in the labs, use of clinical tutors, employing expert outside lecturers, use of real patients in the labs, and use of clinicopathologic conferences.

Group Activity Leads to Active Learning

Physicians of today have to work as group members and act as group leaders for the management of patients. Every course in the medical school must provide opportunities for this learning. We feel that the bulk of the learning of pathology takes place in the lab, around clinical cases and images. At the beginning of each term, students form groups of 10 to 12. Smaller groups were precluded by limitations in the number of faculty available. A video is shown at the beginning of each lab session that explains the observations to be made on each image for that day (20 – 30 mins). For approximately 45 minutes, each group discusses the images on a caramat, the clinical vignettes for the day, and a list of questions. The group identifies the issues that are not clear to them and need further discussion. This ability to raise relevant questions is an important learning outcome for clinical practice. During the next 45 minutes the faculty work with the students on the images and the clinical vignettes. With some helpful hints, the faculty urges the students to answer their questions. The group activity ensures their learning to interact with others, share the problem solving activity and also understand problems raised by others, which they would have never thought of by themselves. They also learn to care for others. To encourage this activity, we award 5 bonus points to those who actively participate in the groups through the course. We have seen that this approach to answering student questions helps to convert them from passive to active learners.

Clinical Tutors

The number of full time faculty is limited to three for a class of 250 – 300 students. To overcome this low faculty-to-student ratio, we utilize a group of young physicians on the way to postgraduate programs, to work for us for a period of one to two years as clinical tutors. We decided to tap a new resource of persons to assist in our teaching. The Clinical Tutors are physicians from India, Pakistan, and Nigeria who are in Grenada and St. Vincent to do their internship, or are alumni of our school who are waiting to complete the USMLE and CSA exams. Additional physicians from UK and Australia who are keen to get away for a year or two to get experience in tropical countries are also used.

We generally recruit about ten tutors for each year and pay the salary equivalent of first year residents in the US programs. The clinical tutors are trained in the technique of supervising group discussions, within the department as well as by the Department of Educational Services. The tutors attend all the pathology lectures, and preview all of the images and clinical vignettes with them prior to each lab session. To ensure uniformity, we meet to decide the minimum content to discuss with the groups.

Visiting Professor

The SGUSOM invites leading academicians from around the world to participate in our teaching program as visiting professors. This program exposes our students to the best academicians/teachers from the U.S., Canada, and Europe. The students learn about cutting edge research and clinical technologies. Visiting professors often provide SGUSOM students with access to their own education web sites. The result is that our students get access to the best images, clinical correlates, study questions, and discussion groups; thus making it something of a "Universal Class." Visiting professors have also opened their labs to SGUSOM students, and have helped them in obtaining both clinical clerkships and residencies.

Using Real Patients in Lab

Up to six times per course, we bring in actual patients to the lab. The students select one representative to elicit history from the patient. Afterwards the faculty discusses the pathology issues related to the patient. This live experience enriches the students' learning activities.

Clinicopathologic Conferences

The clinical vignettes used in the lab tend to give a simplistic view of clinical medicine to the students. We thought that they should be exposed to complicated cases that require some research on the part of the students. The goal was to teach the students how to solve new and difficult problems on their own. Students are given five cases of this type through each course. They usually are of the type published in New England Journal of Medicine. Each student researches and analyzes the case, then submits a written analysis of signs, symptoms, and investigations. The emphasis is on demonstrating scientific and logical thinking and not reaching the correct diagnosis. One student at random is picked at the beginning of the session to make a 20-25 minute oral presentation to the class. The student and the faculty lead the class to participate in discussing pros and cons. Finally, the faculty demonstrates the pathology findings and discusses the correlates. One of the 5 CPC cases also discusses litigation in malpractice suits. The students put up remarkable performances. They feel happy and proud that they have become mini-doctors already. To encourage active participation, the students get one bonus point for each of the CPCs submitted.

Additional Changes

We provide the students with a course information booklet that is distributed three to four weeks prior to the start of the course. It explains the goals, objectives, and philosophy of the course. It provides students with a course outline, required texts, recommended texts, optional web sites, and CDs for additional study. In addition, it contains a format of lectures and labs. Students are introduced to how the labs function and how one should study for the course. The course faculty, visiting professors, and clinical tutors, along with their roles, are listed. We also provide the students with details about examination format and evaluations, as well as sample test questions to prepare for the examination.

In addition to course modifications, attempts have been made to coordinate pathology with other courses in the medical school. As an example, content overlap with the microbiology course has been minimized. Microbiology now introduces various groups of organisms and the pathology course explains the tissue responses to them. The students see a direct correlation. The pathology professors periodically visit the morgue and harvest pathology specimens from the cadavers used in anatomy dissections. They discuss these specimens in simple terms with the students in anatomy in the morgue itself. This creates a great interest in pathology right in the beginning of the medical curriculum. At the end of each system in the histology course, in the first term, one of the authors spends an hour with the class showing some simple examples of abnormal histology and makes the class discuss the functional implications and derive clinical features. This encour

ages them to study histology better and see the link with clinical medicine.

RESULTS

It is difficult to objectively analyze the results of these curricular changes. The objective data that we have is from student evaluations of the course and student performance on course tests and standardized test. The course evaluations done by the students after each course have been around 4.4 out of a maximum of 5 points. Individual professors' evaluations are in the range of 4.2 to 4.4 out of a max of 5. Student test scores in pathology improved - 40% score more than 90% (A grade), 40% score 80% - 90% (B grade) and 18 - 20% score 70 - 80% (C grade). There has been no failure in the past two years. The results of Part I of the USMLE for SGUSOM in recent years have been on par if not better than the US average. The changes in the Pathology Course might have contributed in some part to this result.

Subjective data suggests that we are meeting the needs of our students. Although the students still feel that pathology is a tough course, they are very positive about their participation in the labs and CPCs. Anything learned in a happy state of mind instead of fear is learned better and retained longer. Student feedback from St. Vincent and Clinical clerkship in the U.S. and U.K. has been very positive. They rate Pathology as the best taught course in the medical school. They also state that they became 'adults' through the course and developed the confidence to handle new problems and solve them. Many of them state that they felt a "de-ja-vu" during the USMLE exams as most of the test items were from their pathology course exams. It is said that the number of students opting for pathology as a career choice can gauge the success of any pathology course. From the first batch that went through the modified curriculum, we know of at least six students who are doing pathology residences. During a recent departmental review of the course, students were asked if they needed any changes in the course. The response was "Please leave the course alone, they are doing an excellent job." Such unanimous appreciation is very rare for any course in the medical school.

CONCLUSIONS

The Pathology Course taught at the St. George's University School of Medicine is unique in some ways - small faculty, large number of students, two courses run every year, short duration of the course, and lack of clinical departments. The course has been converted from a killer course to a course that students can live with. During the past three years, the course was modified in many ways to reduce the content, orient it clinically, encourage group activity, and shift the onus of learning from the teacher to the students.

Many of the Visiting Professors state that they have been harboring similar ideas for curriculum improvement for the past several years. Unfortunately, they have not been able to do so because of rigid departmental barriers and procedural issues in the university curriculum. Fortunately such barriers are few at SGUSOM and curricular improvements continue to be ongoing. We have instituted numerous changes to the course. The most far reaching include the formation of lab groups, emphasis on the use of clinical vignettes in labs and on examinations, use of actual patients in the lab learning, introduction of clinicopathologic conferences, the use of clinical tutors and visiting professors, and curricular integration with other basic science departments.

The changes have resulted in the desired changes. The students enjoy the learning of pathology, take responsibility for their learning and perform better in the local and external examinations. They feel better equipped to be good clinicians.

ACKNOWLEDGEMENT

The authors wish to gratefully acknowledgement the support and encouragement given by Dr. Allen Pensick, Dean of Basic Sciences, Dr. Stephen Ayres, Executive Dean of School of Medicine and Dr. Peter Bourne, Vice-Chancellor of the St. George's University. They also wish to acknowledge the great help rendered by Dr. Carey Williams, Instructor and the Secretaries - Ms. Akisha Jones and Ms. Debbie Croney.

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The Basic Science Foundations of Clinical Medicine: Introducing Beginning Medical Students to the Study of Clinical Cases

Burt B. Hammrel, M.D., Ph.D.

INTRODUCTION

The Basic Science Foundations of Clinical Medicine (BSF) Program at St. George's University School of Medicine, introduces beginning medical students to the study of clinical cases simultaneous with their being trained in the use of medical informatics resources. The BSF provides a framework, within a traditional basic science curriculum, in which students begin to think about themselves as responsible physicians. In its present form it is a one-credit-hour, pass/fail course. It consists of multi-disciplinary panel presentations of episodes in the natural history of a disease, training in computerized searches of literature related to that disease, and small group discussions of information gleaned from the searches. Each panel consists of a clinician and a team of basic scientists, and the emphasis is on the application of basic science information to clinical problem solving.

METHODS

We structure a medical informatics workshop for the first semester medical students. The workshop occurs in our computer laboratory and is based on the use of a widely used medical database (OVID). Each student is required to identify and copy three medical journal articles pertinent to the clinical case being studied (e.g. type I diabetes, sickle cell anemia). The student is responsible for maintaining a notebook, which is used to log experiences in the BSF and to preserve the photocopied journal articles. Also, the students participate in small group discussions. Each student is expected to come to a small group discussion prepared to discuss the contents of the references. Faculty who participate in the BSF participate in ongoing workshops to enhance their abilities as small group discussion facilitators. Student accountability is assessed based on attendance and notebook contents.

RESULTS

The course is well received by the students with responses to survey questions scoring from above 3 to 4 on a 1 to 5 Likert scale. Individual student comments indicate a number of students find the experiences in the BSF exhilarating. On the other hand, there are some students who find the open-ended assignments in the BSF challenging. For them, it is difficult to participate in the BSF learning experience, in which they must identify their own questions to research simultaneous with participating in a traditional basic science curriculum.

CONCLUSIONS

The BSF is our students' first introduction to medial informatics and has become, in that regard, an essential part of the basic science curriculum. Linking exposure to medical informatics with the study of the natural history of a disease is, in our view, important for preparing our students for their clinical studies and professional life. We have concluded it is important to expose our students to the BSF experience early in their medical school matriculation. We are now planning to use structured clinical case studies in the clinical years as a core experience in independent professional learning. With this in mind, we are initiating plans to extend a BSF experience throughout the four years of the curriculum.

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(Paper presented at the annual meeting of GRIPE, Grenada,Jan 2001).

Department of Educational Services (DES)

Glen Jacobs, D.Ed.[1] and Jeffrey Johnston, Ph.D.[2]

INTRODUCTION

The mission of the Department of Educational Services (DES) is to provide support services to the St. George's University community. Our primary goal is to enhance the educational experience of students and faculty members and thereby promote academic excellence.

DES provides services through programs, courses, workshops, and individual sessions. It also provides review questions, resource books, and informational handouts on topics of pertinence to students' studies. We are continually evaluating the needs of the university and working to develop initiatives to address those needs, striving to maintain a friendly and supportive environment in our department, and welcoming input from students and faculty. Our services and programs are outlined below.

SERVICES

DES provides students with a wide variety of services and programs.

Developing Test Taking and Study Skills

The Medical Study Skills Program is a walk-in service that provides one-on-one or group intervention sessions dealing with several areas. These include: 1) learning styles assessment, 2) practical application of study methods to the medical school curriculum, 3) test taking strategies, and 4) time management advice and test anxiety counseling.

Individual Tutorials

Students that feel they are in need of extra, individualized help in one of their courses can make an appointment to discuss their request. If approved, DES will arrange individual sessions for students with a peer tutor.

Course Review Questions

Review questions and answers are currently available for medical school and veterinary school courses. These questions, which are written by the course directors, provide an excellent supplementary resource for studying in the first two terms. New questions are posted on the DES QuickPlace (a self-service Web tool from Lotus) and in the DES reception area each week.

Group Review Sessions

Group Review Sessions are arranged for most first and second term medical school and veterinary school courses. Peer tutors who have successfully completed the course facilitate these sessions. This interactive learning environment allows students the opportunity to ask questions and gain insights into different ways to understand and study difficult material. Review groups are scheduled at a variety of times and in a variety of locations. DES administers approximately 1,000 Group Review Sessions each term.

English Communication Skills Development

The TESOL Program offers classes, workshops, and individualized tutoring to help students develop their English language skills such as reading efficiency, reading comprehension, writing, oral communication, pronunciation, and grammatical accuracy. An individual appointment offers assessment of areas of strength and weakness in English language skills or development of a personalized plan for language skill improvement.

Academic Advising

The Academic Advising Program promotes student academic success and retention via the delivery of professional advising

services. The program offers individualized assistance with a focus on maximizing each student's academic potential. An individual appointment offers 1) assistance with academic and career decisions, 2) medical school academic progress assessment and intervention, 3) assistance with medical school adjustment concerns, or 4) appropriate referral to other campus resources.

ADDITIONAL INITIATIVES ADMINISTERED BY DES

DES provides students and faculty with several other services.

Academic Enhancement Program

A retention and tutorial initiative implemented in the School of Medicine. The basic tenets of this one-year program include diagnostic testing, supplemental instruction, and personal advising.

English Medical Communication Skills Course

A six-credit elective comprised of four skill-specific term-one classes. It is designed for students for whom English is not their first language. It supports students in their medical coursework and also provides them with the opportunity to develop communication skills that will contribute to success in clinical rotations and in their medical careers.

Faculty Development Program

This program promotes faculty growth by assisting faculty members to acquire additional knowledge, skills, and techniques related to teaching and learning. It also improves student learning by instructing faculty members in the preparation of effective courses and learning materials.

Testing and Grading Center

This center primarily provides a service to the faculty with regards to the administration and optical scanning of examinations, quizzes, and student evaluations of instructors and courses, and the preparation of report summaries for the deans of various schools. The center also provides support for the LXR-Test Question Banking and Test Generating program. Special projects not limited to custom surveys or polls are undertaken by the center on direction from university administration. Faculty consultations with regards to course and instructor critiques are provided.

See our webpage www.sgu.edu for more details.

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Presented at the GRIPE meeting in Grenada in Jan 2001.

Introduction of Problem Based Learning to the Lecture

Dr. Bakri O. Saeed M.B., B.S., Ph.D., MRCPath.

INTRODUCTION

Problem-based learning (PBL) uses a clinical problem as a springboard to explore the relevant aspects of the topic in question. PBL incorporates adult learning theory that makes it more effective in acquisition of scientific knowledge and clinical skills than the conventional lecture based learning (LBL) methods (1). The proponents of PBL argue that for PBL to be effective, the entire curriculum should be problem–based. The experience of the universities that have adopted PBL (e.g. McMaster University) created the general understanding that PBL is part of a package including integrated teaching, self-directed learning, and small group learning (2). The use of PBL spread afterwards, although most medical schools that introduced PBL, preferred a combination of PBL and lecture format in what is called a hybrid system. There are now a wide variety of PBL forms that serve different educational strategies.

This article describes the integration of PBL into teaching of a course on endocrine pathology. The article outlines some of the changes, which happened to medical education in North America and Britain, which provided the stimulus to the changes introduced in St. George's University School of Medicine (SGUSOM).

CHANGES IN MEDICAL EDUCATION

Forces of Change in Medical Education

The dissatisfaction with traditional medical education is not new, but the last few decades witnessed advances in medicine and medical sciences, which put a lot of pressure on the medical education systems. Medical information is rapidly expanding and technological advances are changing the way medicine is practiced. Medical students need to acquire the skills to identify gaps in their knowledge and be able to find answers to the questions they face. The patterns of delivery of health care continue to change and there are now more demands for increasing the cost-effectiveness of medical services and calls for increased accountability by the health care workers. Additionally, educational theory and increased knowledge of how people learn provided significant force for change in medical education.

PBL in the New Medical Education

PBL is now a widely used method in medical education and its advantages have been evaluated in numerous studies. Earlier studies showed that the use of PBL is associated with increased satisfaction among students. These students also think that the teaching becomes more relevant (3,4). The degree of student motivation is higher with PBL than in lecture–based learning (LBL). There is disagreement about the role of PBL in promoting lifelong learning and problem solving ability. Furthermore, these earlier studies did not show an advantage for PBL in acquisition of basic science knowledge and some of them have actually shown a drop in USMLE step 1 scores when a PBL curriculum is inaugurated. However, some recent studies are showing no such drop or even an improvement in basic science knowledge base by adopting PBL (5-8). Despite these controversies, PBL is widely accepted and is likely to be used more in undergraduate medical education, especially in the teaching of basic medical sciences.

Tomorrow's Doctors

In 1993, the General Medical Council in Britain produced a document called Tomorrow's Doctors, which summarizes the problems with the then current system of medical education and proposed schemes for training doctors for the future (9). The main recommendations of this document were:

1) To reduce the burden of factual knowledge by creating “core” and “options” in medical education

2) To introduce a substantial component of PBL

3) To introduce early clinical contact for medical students

4) To ensure that students develop a firm understanding of the scientific method

The North American Experience

A recently published report highlights the tremendous width and depth of medical education in North America and the changes that have been occurring in the last decade in what was described as the “quiet revolution” (10). There are many lessons to learn from that report.

The report recognizes that education is a dynamic process and continuous review and revision of the educational process and contents is a prerequisite for success. The report emphasized the role of a committed leadership, especially the school’s dean, in achieving the required transition. It also refers to the need to establish offices of medical education and the importance of recognition of the teaching and educational input by the academic staff. The role played by computers in the educational process and the potentials for the future is highlighted.

CHANGES AT ST. GEORGE’S UNIVERSITY SCHOOL OF MEDICINE

The entrepreneurial nature of SGUSOM and the vision and dedication of its leadership made it undoubtedly a story of great success. The leadership of the school realizes that the present success of the school is no reason for complacency or stagnation, as the school needs to keep up the good work and keep aspiring to new horizons. In addition, there are always new challenges and one of them is the clinical orientation of the USMLE step 1 examination. The effort to make the program more relevant is a continuous process in this medical school.

The Dean of SGUSOM is committed to change and the introduction of PBL. These views are shared by the head of the Department of Pathology who successfully led significant changes to the way in which pathology is taught in the medical school in the last few years. Some of these changes were reported at previous GRIPE meetings.

Last, but not least, is the important role of students in making change happen. The degree of motivation and aptitude for hard work in this medical school is probably one of the highest in a medical school. There is also a higher proportion of mature students, some of which with higher degrees and experience in the sciences. They contribute significantly to enrichment of discussions and raising the level of confidence for debate in the class. The environment created by the medical school through the extensive support services available to students helps to alleviate stress and to boost their confidence in the school and in themselves.

Important Considerations

Change is expensive in time, energy and resources, and it can be disruptive. It is therefore important for this school to plan the required changes to serve its objectives without undermining the current success.

Students at SGUSOM are predominantly American citizens who are going to practice medicine in America. The main role of the basic science curriculum is to prepare the students for the USMLE step 1. A good score on the USMLE is important for the school’s future and the ability to attract good students. It will also help students in finding the residency they want. A national exam is a powerful guarantor of standards; thus it will have the most important steering effect on the teaching methods. The school has to ensure that change is not associated with a drop in performance on the USMLE. The change should also take into

consideration the relatively small number of resident faculty and the dependence of the school on a large number of visiting professors. However, the extensive visiting professor program allows the school to draw from a very wide range of academic experiences, especially in North America and Britain, which could aid introduction of change.

PBL in the Lecture

PBL is now an established method of teaching in the pathology course at SGUSOM in practical classes and through clinical pathologic correlates (CPCs). Both paper cases and real patients are used in these exercises. The medical school has no intention of transforming the curriculum into a fully PBL oriented curriculum.

The intention of the experiment described in this article is to keep the lecture format as an effective vehicle of knowledge transfer while taking advantage of the merits of PBL as a teaching tool. These merits could be summarized as: 1) increased relevance and clinically-oriented structuring of knowledge, 2) motivation, 3) integration of new knowledge into existing knowledge, 4) active participation by the student, and 5) training on issues of forward reasoning (from data to solutions) and hypothesis generation.

The use of PBL or case teaching in lectures is not new. Barrows (11) described these forms:

1. Lecture-based cases: A case or two are given at the end of the lecture to demonstrate the relevance of the information
2. Case-based lectures: The students are presented with a case, which they analyze using their prior knowledge, before new knowledge is provided
3. Case method: Students are given a long case for study and preparation or subsequent class discussion

The form of PBL described in this article is derived from the last two strategies, but we were not aiming at fitting into these prototypes in a dogmatic way.

The features of PBL adopted in lectures at SGUSOM could be summarized as follows:

1. It aims at making learning more relevant, challenging, and stimulating by addressing the objectives stated above. It is not concerned with PBL orthodoxy, especially since some of the theoretical and practical basis of PBL are coming under critical scrutiny (12)
2. The cases used for the endocrine pathology course are five major cases, which are distributed to the students before class to be presented by them and minor cases that are used by the lecturer in class. Each clinical case is accompanied by a set of questions
3. It is a form of guided discovery learning rather than student-directed discovery learning. Students are given handouts, which guide their learning. Students are encouraged to attempt the questions before class individually or in self-selected groups
4. Student involvement: several strategies are employed to ensure participation of as many students as possible
   (1) The class is divided up into groups and every student group is responsible for presenting one major case. The whole group is responsible for defending the views put forward by their representative
   (2) The learning environment is friendly and non-judgemental
   (3) Some degree of noise resulting from sidetalk is tolerated

Construction of the typical clinical problem follows the following steps.

1. All problems are real problems obtained from the lecturer's experience or from published cases. The student is asked to portray the treating doctor. The problems are written in a way that guides students to concentrate on the relevant issues while keeping the main features of the clinical problem

2. The clinical problem is written in a structured, sequential manner to help in developing ideas and outlining important facts
3. The new information is related to old information
4. Principles of forward reasoning (from data to solutions) and hypothesis generation are embodied in the clinical problems. The discussion of hypothesis and alternative hypothesis is done at the level of pathophysiological considerations
5. The treatment is briefly discussed for the sake of completion and to associate understanding with action in the student's mind

Potential Disadvantages of PBL in Lectures

We have found that this approach has several inherent problems. There is less time available to spend on exposing difficult concepts. The composition of the class has to be taken into account and the pace of discussion has to be appropriate for the majority of the class. Some students may not learn best this way and allowance has to be made to provide further support outside class. Teaching by problems is generally recognized for raising the anxiety levels among students who are looking for a solid account of facts to deal with. The handouts and lecturer's summaries are very important in alleviating such anxiety. It is a more demanding form of teaching for the lecturer. Time is spent constructing the problems, which have to be changed regularly. A degree of discipline is necessary to ensure complete coverage of the course within the specified time.

CONCLUSIONS

Our experience in this medical school has been very positive regarding the introduction of PBL into practical classes and lectures. We do not yet have objective outcome measures due to the difficulty of researching this issue in general and some local difficulties. Indeed, many of the studies that evaluated PBL remain the subject of criticism due to the difficulty in designing such comparisons. More results are being reported using the USMLE as an outcome measure (7,12). Students continue to improve their scores in the USMLE, which is a credit to the school at large. The satisfaction of our students with the pathology course in general is very high as reflected in the surveys collected by internal and external reviewers. We hope that the PBL component will help them become better doctors in the long term and help them with the USMLE step in the short term. The USMLE is becoming increasingly clinically oriented which may increase the validity of the problem-based approach.

REFERENCES

1. Schmidt HG. Foundations of problem-based learning: some explanatory notes. Med Educ 1993, 27:422-32.

2. The McMaster Philosophy. An approach to medical education. McMaster Education. J Med Edu 1974, 49:1041-50.

3. Albanese MA, Mitchell S. Problem-based learning: a review of literature on its outcomes and implementation issue. Acad Med 1993, 68:52-81.

4. Vernon DTA, Blake RL. Does problem-based learning work? A meta-analysis of evaluative research. Acad Med 1993, 68:550-63.

5. Doig K, Werner E. The marriage of a traditional lecture-based curriculum and problem-based learning: are the offspring vigorous? Med Teacher 2000, 22:173-8.

6. Bligh J, Lloyds-Jones G, Smith G. Early effects of a new curriculum-based clinically oriented curriculum on student's perception of teaching. Med Educ 2000, 34:487-9.

7. Blake RL, Hosokawa MC, Riley SL. Student performances on step 1 and step 2 f the United States Medical Licensing Examination following implementation of a problem-based learning curriculum. Acad Med 2000, 5:66-70.

8. O'Neill PA. The role of basic sciences in a problem-based learning clinical curriculum. Med Educ 2000, 4:608-13.

9. General Medical Council. Tomorrow's Doctors. Report of the Education Committee. London:GMC;1993.

10. Brownell Anderson M. A snapshot of Medical Student's Education at the beginning of theb21st century. Report from 130 Schools. Acad Med 2000,75: (suppl no.9)

11. Barrows HS. A taxonomy of problem-based learning methods. Med Educ 1973, 81-486,

12. Way DP, Giagi B, Clausen K, Hudson A. The effects of basic science pathway on USMLE Step 1 score. Acad Med 4 (suppl) 1999, 10: S7-S9,

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A Five Step Approach to Clinical Case Writing in the Structural Sciences

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Key Words: Problem-based Learning, Case Writing, Anatomy, Anatomic Pathology, Histology, Embryology, Radiology, Surgery

ABSTRACT

We present a five-step approach to writing Problem-Based Learning (PBL) cases in the structural medical sciences; Gross Anatomy, Histology, Embryology, Radiology, Surgery, and Anatomic Pathology. The process of choosing a topic, gathering materials, constructing, writing, and review is described. It is concluded that case writing in the structural disciplines is made easier by the availability in most cases of imaging studies, histological slides, and surgical and pathology reports that can add richness to the PBL paper case and to the students' experience.

INTRODUCTION

There is practically no medical curriculum in the United States or Canada that has not incorporated some Problem-Based Learning (PBL) techniques. PBL requires small groups of students to discuss a paper case that is serially disclosed one page at a time over a variable number of days. Faculty in each discipline are faced with constructing paper cases that are realistic and stimulate the student to a discussion of the principles of the discipline. Choosing appropriate cases requires some skill and expertise. There are some clinical entities that are better suited to discussion in the structural sciences than others. For example, a case of diabetes with no evident neuropathy, vasculopathy, or retinopathy might not have any imaging studies, biopsy results, surgical summaries, or other structural reports appropriate to courses in the structural disciplines.

CASE SELECTION

We present here our stepwise approach to writing clinical cases. This approach is based on 12 years of experience in choosing and writing appropriate cases for courses in Gross Anatomy, Histology, Embryology, and Pathology. Table 1 lists cases, by instructional topic in a combined Histology and Gross Anatomy Course at the Northwest Center. The experience can be generalized to include the disciplines of Pathology, Radiology, and Surgery.

Step 1: Choose a Clinical Entity

The first step in choosing an appropriate case is to take a hard look at the course schedule and sequence of topics. Because each case usually takes two or more sessions, it is likely that one or possibly two cases can be discussed in relation to any one topic. In coordination with instructional topics, several good examples of appropriate disease entities can be suggested for each week of instruction. A good case for the structural sciences obviously contains structural tests, such as imaging studies, surgery, and biopsies or surgical specimens. Disease entities that include tumors, transplants, trauma, and/or developmental abnormalities are especially appropriate.

At this stage, you may have a list of several possibilities for each instructional topic. Over time, you may wish to construct two or three cases for each topic in order to be able to rotate cases every other year (Table 1). This keeps student interest higher because it minimizes cross talk and sharing of case information between medical school classes.

TABLE 1
Examples of Cases for Structural Units

Structural Content	Clinical Cases
Cell Structure	Lysosomal Storage Disease
Basic Tissues, Limbs	Osteosarcoma, Achondroplasia, Osteomyelitis
Heart	Coronary Artery Disease, Cardiomyopathy, Transplant
Lungs and Chest	Small Cell Carcinoma, Emphysema
Abdomen and GU Tract	Biliary Atresia, Transplant, Familial Polyposis Crohn's Disease, Pancreatic Carcinoma, Ischemia
Lymphoid Organs	Hodgkin's Disease, Leukemia
Urinary System	Renal Cell Carcinoma, Trauma
Reproductive Tract	Ectopic Pregnancy, Infertility, Testicular Cancer
Endocrine System	Cushing's Syndrome, Multiple Endocrine Neoplasia
Head and Neck	Maxillary Antral Tumor, Inflammed Paranasal Sinuses

The disease entities for which cases have been developed are listed for a combined Histology/Gross Anatomy PBL course at the Northwest Center for Medical Education, Indiana University School of Medicine.

Step 2: Choose a Good Case Demonstrating the Clinical Entity

In our experience, it has been most productive to begin with the help of a radiologist in finding a case that fits the instructional objectives of structural courses. The radiologist can review past cases in order to select one with good imaging, often with several forms of imaging such as plain films, special contrast studies, CT scans, MRI scans, or ultrasound. In some circumstances, a case might be chosen based on the availability of other anatomical material such as a gross specimen from the pathology laboratory. However, structural medical cases routinely have imaging studies performed and they are easily copied for multiple small group sessions. In contrast, it is more difficult to have gross specimens for several small group sessions.

Step 3: Gather Information and Material

Once a typical case has been chosen, the information to be used to construct the case should be gathered. Often, using the radiology case as a starting point, hospital charts can be located and used for H&P details, laboratory test results, radiology reports, pathology reports, and surgical discharge summaries. In the case of surgically removed specimens, histological slides can be provided from the pathology laboratory. The more material, test results, and lab data that is included in the case the better the case will be.

Step 4: Construct the Case

With all the data in hand, the case can now be written. Obviously, the case should be

constructed according to the time course of your small groups sessions. We recommend three case sessions per week with two intervening days of study for first year medical students. More advanced students can handle cases in two sessions with one day of study. Regardless of the number of sessions, there should be a beginning, middle, and end to the case with the appropriate number of pages of information chosen to fill the students' time both inside and outside the PBL session.

Faculty will have to use their discretion in deciding how many pages of information to give out in any one day and where to make a break between the first and subsequent days of the case study. Many times we have found that it works well to give all information on the case including the radiology on the first day, but saving the radiology report or the surgical summary until the second day. This approach allows the students to struggle with the images or surgical approach and seek out resources or experts to help them before returning for the second day.

In writing the case, especially in the structural medical sciences, we have found that giving out the diagnosis early in the case does not hurt. Many times, the diagnosis is not the problem, but rather what the treatment, management and prognosis will be. To our surprise, even with early first year students, it has been our experience that little special instruction is required in radiology for students to interpret images well enough to sustain discussion of the case. After one or two cases, they become familiar with densities, basic symmetries and cross sectional interpretation.

Modifications of the case can be made to enrich the case or to direct the students to other educational objectives, but care must be taken to keep the case realistic. To this end, we make it a practice to never withhold information from the student that is available or would be available in a typical case of the kind studied. Faculty might be tempted to prolong the study or expand the possibilities with red herring tests and issues. This is generally a mistake and will make the experience less valuable for students.

Step 5: Seek Review of the Case by Colleagues

For the sake of clarity and realism, we have found that it is valuable to have colleagues from several disciplines review the case for realism. In addition, the same process should be followed in order to update older cases.

CONCLUSIONS

In many ways, case writing in the structural disciplines is made easier by the availability in most cases of imaging studies, histologic slides, and surgical and pathology reports that can add richness to the PBL paper case and to the students' experience. These materials and their logical sequence of discovery make constructing a case a simple matter of rewriting and putting the information in proper series. The more difficult matter is choosing a clinical entity that fits with the instructional objectives and is complicated enough, but not too complicated, to stimulate student learning. No paper case is ever a disaster though. They are simply better or worse at meeting the instructional objectives of a particular course. Faculty can be comforted by the knowledge that all cases are valuable to the student.

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Writing a Learning Objective Based Laboratory in Pathology Results of a GRIPE Workshop

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INTRODUCTION

Over the past six years, the laboratory sessions used for second-year instruction of medical students at the University of Illinois College of Medicine at Rockford have been rewritten, using a multi-station interactive format. During this time, we initiated a process for the construction of an educationally sound laboratory. The initial step of this process is a critical assessment of the knowledge and skills we wish to teach in each laboratory exercise, as expressed in a set of learning objectives. During the Summer, 2000 GRIPE meeting, we presented a workshop modeling the initial steps in construction of such an objective-based laboratory exercise, using the GRIPE participants to develop learning objectives for a laboratory over the topic of neoplasia.

METHOD

The workshop was presented over two sessions on separate days. In the first session, we presented our objectives for the workshop followed by a brief discussion over the principles of writing learning objectives (1,2). Ideas for topics that might be covered in a laboratory session on neoplasia were solicited and discussed in a "brainstorming" session with the large group. As they were suggested, the topics were listed. The group then debated the appropriateness of the topics, discarding those felt not amenable to use in a laboratory format, and combining closely related topics where appropriate. Robbin's Pathologic Basis of Disease, 6th ed. and Rubin & Farber's Pathology, 3rd ed. were provided to the group as a resource (3,4). The list of key topics was narrowed to seven by the large group.

The large group was then split into seven small groups, with three to four people. Each small group was assigned one of the topics, and asked to write two or three learning objectives suitable for use in a laboratory teaching session. They were also asked to list resources that they might use in the laboratory session to assist the students in accomplishing their learning objectives. Finally, each group was asked to suggest a method of student evaluation that might be used to assess whether the students had accomplished the learning objectives. Examples of resources and evaluation techniques we have used in our laboratory sessions were provided to the groups, but they were encouraged to suggest items and techniques not on the list of examples. At the end of the first session, each group's suggestions were collected.

We recorded each of the groups' suggestions after the first session, and gave each participant a copy of the collated learning objectives, list of resources, and suggested evaluative techniques for each of the seven topics. The following day, we briefly presented the information to the participants, with our reflections and comments on the material generated. Following the workshop, we compared the groups' learning objectives, resources, and evaluative techniques to those we generated when writing our own laboratory on neoplasia.

RESULTS

The large group identified a list of topics as being key concepts for a laboratory exercise over concepts of neoplasia. These included:

1. Definitions and characteristics of benign and malignant tumors
2. Tumor classification and nomenclature
3. In-situ and invasive carcinoma
4. Dysplasia, anaplasia, and predisposing factors

5. Laboratory diagnosis of tumor
6. Tumor grading and staging
7. Complications and effects of tumors.

The seven small groups then generated a list of learning objectives for their assigned topics. These included:

1. From the gross or microscopic imageprovided, identify features that differentiate benign from malignant tumors. List and explain how clinical laboratory tests can help differentiate benign from malignant, giving examples

2. Identify and list characteristics of each of the following: teratoma, adenocarcinoma, leukemia, fibrosarcoma, and glioblastoma. Distinguish between the following pairs of benign vs. malignant tumors, giving characteristic features of each: adenoma vs. adenocarcinoma, in-situ vs. invasive breast cancer, leiomyoma vs. leiomyosarcoma, teratoma vs. teratocarcinoma. Identify the following subtypes of carcinoma: transitional cell carcinoma, adenocarcinoma, and squamous cell carcinoma

3. Describe the natural history and clinical importance of in-situ carcinoma, contrasted to invasive carcinoma. Compare their gross, and microscopic findings, and treatment principles. Describe the utility of screening tests

4. Including known precursor lesions, describe the sequence of events that occurs in the development of cervical carcinoma. List ways to diagnose non-invasive lesions and identify screening programs that use these methods

5. List three ways a cancer diagnosis may be made, giving examples of each. Compare/contrast screening and diagnostic tests for cancer. Compare FNA, incisional, and excisional biopsies. Describe how a serum test such as CEA could be used in diagnosis, screen ing and follow-up

6. Given clinical information regarding a tumor, be able to apply TNM staging. Given a microscopic slide of a tumor, be able to classify the neoplasm as well, moderately well, or poorly differentiated. Given the grade and stage of a tumor, select from lab materials the ones that best fulfill the given staging and grade

7. Describe at least five structurally related and three non-structural (chemical, hormonal, cytokine) complications of neoplasia. Explain a rationale for features or qualities of the neoplasm producing each complication

DISCUSSION

Workshop participants had little difficulty in reaching consensus over the list of seven topics appropriate for inclusion in a neoplasia teaching laboratory. Their choices reflect topics that inherently include gross and microscopic imagery that include: 1) benign and malignant tumor characteristics, 2) grading and staging, 3) dysplasia, in situ and invasive malignancy, and 4) metastatic behavior. Also found appropriate were topics in which students applied criteria or principles to make a decision (tumor classification, staging, grading).

The group rejected several topics as less appropriate for use in a laboratory format for teaching, including review of cell cycle concepts, molecular and sub-cellular events in carcinogenesis and cancer epidemiology. These topics in general lack morphologic correlates, are less suitable for interactive learning, or are better presented in alternative formats.

The topic list generated by participants is remarkably similar to the one that we had previously used to construct our neoplasia lab (Table 1). Items stressed in both lists included local and systemic effects of tumors, differentiating benign from malignant tumors, tumor classification, grading and staging, and diagnostic techniques. All of these topics involve morphology, application of criteria, or correlation with clinical presentations, which we believe are ideally suited to cover in a laboratory format, where side by side comparisons are easy to make.

TABLE 1
Topics from Neoplasia Lab
University of Illinois at Rockford

Topics
1. What is a neoplasm?
2. Benign vs. malignant neoplasms
3. Classification of tumors - H&E histology
4. Classification of tumors - Special techniques
5. Tumor grading and staging
6. Cancer screening techniques

TABLE 2
Resources Suggested by Workshop Participants

Teaching Resources
1. Photographs, images
2. Graphs and charts
3. Pedigrees
4. Glass slides (histology and cytology)
5. Gross specimens (wt or plasticized)
6. Texts and study guides
7. Clinical vignettes
8. Radiographs, CT scans, MRI scans
9. Web based lab

Not surprisingly, there is some overlap of topics and learning objectives in the lists developed by workshop participants. In a real-life situation, it is easy to resolve these overlapping objectives to arrive at your final list. Following this, appropriate materials could be selected to illustrate the principles covered in the lab. A list of such materials proposed by participants is summarized in Table 2.

CONCLUSION

Our laboratory sessions have improved by focusing on writing good learning objectives that stress active learning on the part of the student. Student feedback has been consistently positive. The labs have more consistency and focus. Concentrating on an active format, such as the participant's suggestions in the station over grading and staging makes for a more exciting and interesting lab experience for the student.

Utilizing learning objectives in your labs also will ease the process of student evaluation. As you have already set the level of expectation for your student through learning objectives, it is relatively easy to select materials with which to evaluate the student. For example, if they have staged a cancer in the lab, it is straightforward to give them another case to stage for their examination. Utilizing learning objectives to write your laboratory exercises will assist you in placing the student's learning in context, helping them build skills by practical experience (5).

REFERENCES

1. Freeman V. Writing Instructional Objectives, Pathology Education, 24:1 1-6, 1999.

2. Schulthein NM. Writing Cognitive Educational Objectives and Multiple-Choice Test Questions. Am. J. Health-Syst. Pharm. 55 2397-2401, 1998.

3. Cotran RS, Kumar V, and Robbins SL. Pathologic Basis of Disease, 6th ed. W. B. Saunders Co, 2000.

4. Rubin E. and Farber JL. Pathology, 2nd ed. JB. Lippencott, 1999.

5. Mann, KV. Educating Medical Students: Lessons from Research in Continuing Education. Acad. Med. 69:1 41-47, 1994

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Establishment of a Novel Web Site for Pathology Education

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THE PROBLEM

In the College of Medicine and Public Health there are three separate preclinical tracts {i.e. Lecture/Discussion (L/D), Independent Study Program (ISP), and Problem-Based Learning (PBL)}, and pathology education is an integral component of each. In addition to the three medical student curricula, first year optometry students and dental students receive different instruction in the basic mechanisms of pathology and systemic pathology, while graduate and undergraduate students in biomedical research receive similar instruction in the underlying cellular and molecular mechanisms.

There is little uniformity of content in how pathology is presented to these diverse groups of students. The problem is magnified by a lack of consistency in presenting the basic images needed to complement lecture material. The three medical student curricula call for formal labs in pathology for only L/D students. ISP and PBL tracks have little exposure to microscopic images and even less exposure to gross images. In addition, there is no pathology lab for the dental, optometry, or graduate courses.

OUR SOLUTION

We created a Pathology Education Web Site (PEWS) to help solve these problems. PEWS complements lectures, facilitates different learning styles of students, and provides a uniform approach to learning pathology that involves self-study and self-assessment for students on and off campus. As an on-line resource, PEWS provides students with on-demand access to various learning and laboratory modules, which contain high quality photo galleries, slide shows, animations, sound, and instructional text to present fundamental educational aspects of general pathology as well as diseases of specific organ systems. The PEWS curriculum is comprised of a series of topic modules (e.g. Breast, Cell Injury and Death) that are divided into concept units (e.g. Clinical Assessment of a Breast Mass, Hyperplasia). Figure 1 shows the outline and structure of the “Breast” module. The book and question mark icons show how instruction is interspersed with drill and practice. Items in italics indicate progress and the word “NEXT” indicates a bookmark. At the top of Figure 1 is the PEWS navigation bar, which appears on all pages and whose buttons are described in Table 1.

PEWS and the Mastery Learning Model

PEWS is based on the Mastery Learning (ML) Model, which is based on the theory that students of varying ability can learn the same material when given enough time. The ML model contrasts the classical learning model in which all students are given the same amount of time (through schedules established by the teacher), but must learn according to ability. The ML model shifts the focus of learning from the teacher to the student. Initially the model was cost prohibitive, but with today’s web technology, the model is easy to implement and works well with PEWS.

In the ML model of PEWS, a student learns pathology concepts asynchronously by studying instructional text and then demonstrating mastery by correctly answering questions and completing a post-test in a time frame that is not fixed by the instructor. A PEWS topic module contains several general concepts units that contain specific instructional items interspersed with questions for drill-and-practice (D&P). Elaborative feedback accompanies the D&P questions to provide a self-assessment component and advance the instruction. A post-test is presented at the end of

Figure 1
Breast Outline Showing Student Progress and Linear Organization

TABLE 1
PEWS Navigation Buttons

each topic module to assess a student's level of mastery of that module's concepts.

Instructional Items and Questions

A very important instructional feature in PEWS is juxtaposed content. Instructional items contain juxtaposed images, figures, tables, and animations like those of normal and pathologic specimens as well as gross and microscopic features. This feature is often lacking from other pathology web sites, and can integrate interpretive information from different disciplines that is critical to the audience. This feature is illustrated in Figure 2, which shows how juxtaposed images of lymph node metastasis are used to present the concept of "Major Prognostic Factors" in the Breast module on instructional page 7.1.5.1-3. Following this instructional page, a D&P item is presented, so that the student can assess his/her understanding of the concept.

Drill-and-practice is another important feature. Figure 3 shows a Matching Question (D&P) that is presented during the "Mammography" concept. The student must answer the question correctly in order to proceed to the next question or instructional item. Elaborative feedback is presented for incorrect responses, and thus, the student has the opportunity to learn from the question as well as the instruction. The diagram in Figure 4 shows that the student can select the museum to provide additional examples and/or the glossary (Figure 5) with definitions, corresponding images, and proper enunciation. Each module not only presents information, but also challenges the student to master fundamental concepts though D&P items, unit quizzes, and a final exam.

Module Review and Progress

At any time in the module, the student can access a review page (Figure 6) that presents a list of incorrectly answered questions and links to the associated instruction. The top table indicates that the student has scored well in five of the six sections (concept units), but has mastered only 67% of the questions in section #2. However, the module outline in Figure 1 shows that the student has just begun section #2 – Clinical Assessment of a Breast mass – and will see many more questions. To raise his/her score to the required 100%, the student uses the bottom table to retake the missed question(s). In order to achieve mastery for the question, the student must answer a question correctly on the first try, and not rely on the elaborative feedback. The bottom table also provides links to related instruction and to a museum of pertinent images.

The PEWS Database and Authoring Tools

Behind PEWS is an easy-to-use authoring tool written in Microsoft Access 97. Approximately 12 database tables contain both content data and student data. The tables are very similar to Microsoft Excel tables and contain, for example, the curriculum module list, module outlines, module scripts, and student performance data. User-friendly forms provide the author/instructor with a very simple way to enter instructional material and questions. For example, Figure 7 shows the form that the instructor used to create the instructional page that is displayed in Figure 1. Forms are available for creating outlines and building pages from a set of page templates that determine the number and arrangement of "frames" displayed in the web browser.

PEWS is deployed to the Internet via a Microsoft Internet Information Server running on a Pentium III, Microsoft NT platform. Active Server Pages (ASP) is used extensively to dynamically create and populate PEWS pages from the database. Open Database Connectivity (ODBC), is used to access table information. All images and corresponding image information (e.g. title, tissue, diagnosis,) have been stored using the Pax-It image database software which is a Microsoft Access application running on Windows NT. However, PEWS does not require Pax-It, and images can be stored in normal Windows Explorer folders.

Figure 2
Juxtaposed Images of Lymph Node Metastasis on Instructional Page

Figure 3
Drill-and-Practice Question Demonstrating Elaborative Feedback

Figure 4
PEWS Topic Module and Concept Units

Figure 5
Glossary with Images

Figure 6
Review Page

Figure 7
Authoring Form for a Page with Three-Frames

CONCLUSIONS

PEWS has been very well received by our second year medical students, who have accessed the system for several hundred hours and who have provided us with much constructive feedback over the past three years. Some have even suggested that they would prefer to use PEWS exclusively for instruction. Some have suggested that PEWS could replace two-hour laboratories. At this time, however, because the PEWS curriculum is still under development, it is our intent that the current modules be used as an adjunct to lectures and labs and not as a substitute.

Future plans for PEWS include developing a Case-Based learning system. We will develop a case-based module that integrates clinical features of the case with its underlying pathophysiology. The module will incorporate role-playing and "expert consultants" to engage the students in the case scenario. In addition, real-time use of a cost per clinical test databases will introduce students to the relative economic impact of their testing and treatment choices. Completion of the case-based module will produce both medical and economic outcomes, and will provide a means to determine student competency.

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ACKNOWLEDGEMENTS

This work was supported in part by a grant from The Ohio State University Technology Enhanced Learning and Research (TELR) Institute, whose mission is to create opportunities both in and out of the classroom for both faculty and students to supplement academic and research activities. Matching funds were provided by the College of Medicine and Public Health, the Department of Pathology, The College of Optometry, and the College of Dentistry. The authors wish to thank these sponsors for their support and patience, as this program continues to grow and additional content is added to the PEWS curriculum. The authors also wish to thank the many students who have participated in the PEWS program for their valued feedback and direction.

Web-Based Virtual Microscope Laboratories

Fred R. Dick, M.D.

ABSTRACT

Virtual microscope slides in FlashPix file format, have been incorporated into the University of Iowa medical student histology and pathology courses. Virtual slides consist of a seamless 100 megabyte montage of up to 1200 contiguous high power fields of a traditional glass slide. Using a standard web browser, virtual slides can be magnified from 12.5x through 400x and moved in a x-y axis, thus nearly perfectly emulating a traditional microscope and glass slide. Advantages of virtual slides include accessibility, efficiency of learning, and decreased need for large microscope laboratories, all without loss of the educational advantages of the traditional microscope.

INTRODUCTION

There is an increasing tendency for medical schools to digitize selected fields of their microscope slides for web-based study, and to make traditional microscope laboratory study optional. This tendency is of concern because of the sacrifice of the key aspects of traditional microscope study that allow the learner to examine entire tissue sections, as opposed to images of selected static fields. Virtual microscope slides in FlashPix (fpx) file format, pioneered in histology and pathology courses at Iowa, offer a viable alternative to the traditional method of teaching microscopy. Virtual slides can be manipulated through multiple magnifications and in an x-y axis at each magnification. This process nearly perfectly emulates a traditional microscope and glass slide, thus allowing students to independently explore the entire histologic slide and discover relationships on the computer, as opposed to viewing instructor prepared static images on the computer.

FEATURES

The Virtual Laboratory for our courses, in addition to containing virtual slides, also has the advantage of computer assisted instruction. The Virtual Laboratory for histology has an on-line laboratory manual with a link to annotated images, and the Virtual Laboratory for pathology has links to case histories, gross specimens and radiologic images, all accessible from any computer on campus or via cable modem (Figure 1).

Because of fair use restrictions on some of the glass slides and GRIPE gross images, the University of Iowa Virtual Laboratories are on an intranet. However, many of the virtual slides from the Virtual Laboratories can be viewed at: http://www.medicine.uiowa.edu/pathology/uarep_histopathology and http://www.medicine.uiowa.edu/pathology/nlm_histology that are public domain sites.

Technical Details

We began working with MGI LivePicture (http://www.mgisoft.com) in 1998, and with MicroBrightField (http://www.microbrightfield.com) in 1999 as they adapted their research-based technology to education. Virtual slides for the Virtual Laboratory were digitized from traditional histologic glass slides using a microscope with a motorized stage, autofocus, videocamera, and a Pentium III computer with two gigabytes of RAM and Windows 2000, all coordinated by MicroBrightField software. Up to 1200 contiguous 400x high power microscopic fields are automatically captured and tiled together into a seamless montage (approximately 18,000 x 18,000 pixels), resulting in a tif file of approximately 1 gigabyte for each slide. This file contains up to 0.9 x 0.9 cm. of the tissue of each glass slide. Also, up to 1200 contiguous fields at 630x or 1000x can be digitized from blood, bone marrow and PAP smears. It takes up to one to two hours

Figure 1

This screen shot of the Virtual Laboratory for the pathology course illustrates the glass slide and a thumb-nail with the area that was digitized within the rectangular outline (upper left). A representative 400x microscopic field is shown at the right. The control bar at the bottom of the microscopic field allows the student to change magnification in two fold increments (12.5 x, 25x, 50x, 100x, 200x and 400x) using the (+) and (-) icons, and to move the slide in a horizontal plane at any magnification with the click and hold hand icon. Students can reveal the patient's history, radiological findings, gross specimen, and case discussion by clicking on the corresponding text at the lower left.

of fully automated microscope and computing time to create a 1200 field montage from one slide. In the future we anticipate it will be technically possible to digitize up to 4000 contiguous fields and beyond.

The tif image is saved in a compressed fpx image file format with MGI LivePicture software, resulting in a file of up to 100 megabytes per slide. Conceptually the fpx format is a pyramidal stack of jpg-compressed images with a full sized, full resolution image at the base and a small, low-resolution image at the top. A zoom function jumps from one layer in the stack to the next, changing magnification by two fold with each click of the mouse. A click and drag function allows scanning of each layer of the stack in an x-y-axis. MGI Zoom server software, delivers the fpx files from the College of Medicine web server, and virtual slides are displayed in standard HTML frames on a Windows platform with an MGI plug-in. Currently only Windows platform is adequately supported, but there are plans to support all platforms in the future.

Implementation in Histology

In the spring semester of 2000 we carried out a formative evaluation of the Virtual Laboratory in the first year histology course for 160 students. Glass slides from two units of the course were digitized, placed on the Iowa College of Medicine web server, and made available to students in an intranet as a supplement to the traditional microscope laboratory. Students rated the Virtual Laboratory equal to the traditional laboratory with respect to clarity of morphologic images, ease of use and content. They rated the Virtual Laboratory superior to the traditional laboratory with respect to efficiency of learning and accessibility (1).

Based on this positive formative evaluation, the entire set of 110 histology course slides were digitized and implemented in the 2001 spring semester. After conducting the two introductory laboratory sessions in the traditional laboratory, the remaining nine laboratories were taught with the Virtual Laboratory in computer centers in the Medical Library Information Commons, Anatomy Learning Center and the Pathology Learning Center, with two students per computer. Students also had access to traditional microscopes in the Pathology Learning Center. An instructor was present in all three sites to interact with students at individual work-stations or microscopes, as well as to project virtual slides to the whole class. As anticipated from the formative evaluation, students preferred the Virtual Laboratory. The average use of traditional microscopes was less than 10% of the 160 students per session. The majority of students attended the scheduled laboratories, while others preferred to access the Virtual Laboratory on their own outside of scheduled laboratories. Server log files indicated 636 home page hits per week or approximately 4 student visits per weekly laboratory unit, and 2.5 gigabytes served per week. There was no decrement in mean student performance on the practical examinations: 81% in 2000 and 85% in 2001.

Implementation in Pathology

In the second year pathology course for 151 students there are no formal laboratory sessions; however, students must examine microscopic slides and associated patient scenarios on their own in preparation for small group Case Analysis sessions, where students are expected to present the slides and cases. For the fall 2000 Pathology course, all of the 67 slides in the course were digitized and placed in the Virtual Laboratory on the web. These were linked with gross images, radiologic images, and patient case histories, all of which had been put on the web in 1999. Thus the only variable in 2000 was adding the virtual slides to the web. Students were free to prepare using the Virtual Laboratory or the traditional microscope laboratory. Attendance in the traditional laboratory decreased to approximately 25% of that from 1999, which had been near 100%; indicating that a majority of students in 2000 worked with the Virtual Laboratory. This was confirmed by server statistics that showed an average of 2.8 student visits per week to the pathology Virtual Laboratory site, with approximately 2 gigabytes served per week. Based on

the year-end evaluation, students thought image quality of virtual slides was nearly equal to that of traditional slides, but felt that they learned better using the Virtual Laboratory. There was no decrement in their scores on repeat microscopic exam items from 1999 to 2000. Faculty subjective evaluations showed an increase in student's skills at demonstrating the content of microscopic slides in a small group room equipped with a computer and projector vs. no change in small group rooms with traditional microscope and video monitor. Finally, faculty unanimously found the virtual slides very useful in preparing to facilitate small group discussion because they could prepare from their offices using their computer.

Benefits of Virtual Slides

Although the major innovative aspect of virtual slide technology is that the computer can emulate a real microscope and glass slide, there are several other educational advantages of virtual slides. A major advantage is efficiency and accessibility. The efficiency is based on the fact that students have all of the slides accessible at the click of a mouse, in focus, and with proper lighting and condenser adjustment. They are also annotated and integrated on-line with patient history, gross images, radiological images, and linked to other web-based resources. This presents a markedly different experience from sitting at a traditional microscope with a photocopied syllabus. Additionally, not all students have the same aptitude or interest in using a microscope. Because the virtual slides are always in focus and with proper lighting, students can direct all of their efforts to the content of the slide rather than the technical aspects of using a traditional microscope. Also, the single best slide can be digitized for all to see.

Student-student interaction is enhanced. Several students can look at the same virtual slide image on a monitor and compare with their neighbors at an adjacent work-station, whereas a traditional laboratory may have predominantly single headed microscopes. The first day the histology laboratory was held in the computer laboratories, there was a marked increase in discussion among students compared to the traditional laboratory.

Faculty benefit from virtual slide technology in that they can prepare, in their offices, for teaching in labs and discussion groups, project virtual slides in auditoriums and laboratories, and can better interact with students as they observe virtual slides on the computer screen. Faculty can also easily download screen shots of virtual slides for use in other computer based educational programs.

The institution benefits because, as microscope laboratories are moved into computer classroom, we will not have to support both computer laboratories and large uni-dimensional microscope laboratories. Microscopes cannot be completely replaced, because medical students and other students of biology still need to understand how the microscope functions, and a subset of physicians need to know how to use a microscope. However, it will not be necessary for our students to examine 177 slides in expensive microscope laboratories. This recovered laboratory space can be converted to other uses.

In addition to benefiting first and second year medical students at Iowa, we plan to implement a Virtual Laboratory in the pathology course for dental students next fall. We have also evaluated the applicability of the Virtual Laboratory in an undergraduate histology course and in an advanced biology high school course, and received a positive evaluation from both students and the course directors. The unpublished Virtual Laboratory web site is also under evaluation at four medical schools, and we will share it with others if fair use guidelines are satisfied (contact: fred-dick@uiowa.edu).

Breadth of Impact on the Learning Community

We have received a National Library of Medicine Information Resource Grant to develop a public domain database of 150 histology and 300 pathology virtual slides that can be

used by institutions around the world. See http://www.medicine.uiowa.edu/pathology/nlm_histology and http://www.medicine.uiowa.edu/pathology/uarep_histopathology. The intended source of slides for the public domain Virtual Slide Box of Histopathology and Virtual Slide Box of Histology is educators at other institutions. To date, microscopic slides sets for inclusion in these sites have been submitted from five colleges around the country. The content of the pathology slide box will rely on the Core Morphologic Entities of Disease as a starting point for identifying a core list of 300 slides (2). The glass slides will be digitized at the University of Iowa and be served from the University of Iowa College of Medicine server. However, our long-term goal is to make the slides available to all course directors as tif, jpg, or fpx files, so they can be served locally by others. Because the original acquired files are in a universally accepted tif file format they can be edited (e.g. Adobe PhotoShop), or be adapted by others to a variety of server and browser-viewer technologies that currently exist, or are yet to be developed.

We believe this new cutting edge virtual slide technology also has significant potential for innovation beyond medical student and undergraduate education. This includes web-based publishing of atlases, textbooks and articles, continuing medical education, pathology resident education, pathology of experimentally manipulated animals, proficiency testing, and certifying examinations. See http://www.medicine.uiowa.edu/pathology/wbm_example

CONCLUSION

Although the initial equipment and software cost for creating virtual slides is high, we believe this new technology has the potential to revolutionize the way we teach and learn from microscopic images. Our long-term hope is that virtual slide technology will be promoted nation-wide in the many innovative venues described above, so that it becomes an efficient and affordable technology for all.

REFERENCES

1. Harris T, Leaven T, Heidger P, Kreiter C, Duncan J, Dick F. Comparison of a virtual microscope laboratory to a regular microscope laboratory for teaching histology. Anat Rec 2001, 265:10-4.

2. Dick F, Leaven T, Dillman D, Torner R, Finken L. Core morphological concepts of disease for second-year medical students. Hum Pathol 1998, 29:1017-20.

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ACKNOWLEDGEMENTS

Paul Heidger PhD, Professor of Anatomy and Cell Biology-Director of the histology laboratory, Timothy Leaven MA, Instructional Designer, Daniel Consoer BA, Research Assistant II, James Duncan MLIS, Director, Information Commons, Hardin Library for the Health Sciences, Clarence Kreiter PhD, Office of Consultation and Research in Medical Education

FINANCIAL SUPPORT

National Library of Medicine - Information Resource Grant
Internet Projects Award - Universities Associated for Research and Education in Pathology
University of Iowa Student Computer Fee Allocation Award
University of Iowa College of Medicine - Educational Development Fund

Outcome Assessment of Student Utilization of Electronic Educational Resources in Pathology

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ABSTRACT

To facilitate student access to pathology laboratory materials in the sophomore pathology courses, a web site and CD-ROM disks were prepared with images of the laboratory specimens. The lab exercises were imaged using photomicrographs and digital photographs of pathology gross specimens. Each sophomore student received a CD-ROM with the complete lab atlas. Additionally, a public access Internet web site was established using the same database of images. The web site was readily accessible by students with access to the Internet at home, on campus in computer-resource cluster rooms, or in the medical library. Student use of the web site was constantly monitored using web site log file monitoring software. Trends in student use of this electronic resource reveal an intense "exam-oriented" study behavior. Web site utilization was relatively low until the night before an exam, then rose dramatically right up to the minutes before the test. Immediately after the exam, students flooded the computer-cluster rooms and logged onto the web site, presumably to check their answers on the exam. Then, utilization faded away until the next exam. An outcome assessment was done, comparing student performance in the course to student utilization of the electronic resources.

INTRODUCTION

Students indicate a desire for teaching resources to be asynchronous (available at any time, independent of class schedules) and interactive (student controls the content and the rhythm of delivery of the content) (1). Combine that with the universal student desire for materials to be cheap – at least cheap for the student – and the value of electronic learning resources becomes apparent even to the most traditional of pedagogs. Since about 1995, web-based pathology education tools have been an adjunct to educational resources at most medical schools. Whether these tools prove worthy of the effort and expense is difficult to assess.

Rapid change in technology for electronic distribution of educational resources poses a problem for instructors seeking to prove usefulness of resources by outcomes assessment (2). We have attempted to correlate student utilization of electronic learning resources with outcomes. Year-to-year comparison of outcomes data is probably meaningless, as the technology for production and distribution of resources changes greatly in just 12 months; there becomes little basis for comparison. Over a two-year period we administered pathology electronic resources, and compared the student use of those resources to overall performance in the pathology course.

METHODS

In 1997 and 1998 we offered the sophomore pathology students two sources for electronic learning, both produced at Indiana University School of Medicine, and managed by the Pathology Department. One resource was a CD-ROM, prepared by medical students who worked on the project in the Pathology Education Resource Laboratory. The materials for the disk were also loaded onto a public-access web site (3). Students were told in unambiguous terms that the images from the electronic resources would be used on both lecture and lab exams, and that theme was frequently reinforced throughout the course. While student utilization of the CD could not be monitored, student utilization of the web site could be followed with web site software. We soon learned that most of

our students preferred using the web site to the CD. Although the CD runs much faster than modem access to the web site, the web site offers a search engine not available on the CD. Access to the site was greater through a search engine than through direct browser paging. Students could use the web site to search for specific terms, specific lab exercises, even specific assigned microscopic slides by slide number. Surveys were conducted with Institutional Review Board approval after the completion of the 1997 and 1998 academic years to gauge the students' perceptions about the electronic resources, similar to procedures by others (1,4). The surveys were not random, and no statistical interpretation of the responses can be made. The School of Medicine uses a 4-tier grading system – Honors, High Pass, Pass, and Fail – approximating traditional grades of A, B, C and F. Failing students did not participate in the study. Students earning grades of Honors, High Pass, and Pass were selected for survey (Table 1).

RESULTS

The surveys were used to correlate student perceptions to student outcomes. We had the students estimate how much time they spent studying the electronic resources (Tables 2 and 3). Again, the data in these tables is not statistically significant. We found that the response did not at all correlate with web site utilization. The web site log information shows the total log-in time and time per open page. If a student opened the site, and left it open all day, the web log would show hours of use, even though the student had actually spent only a few minutes. This is analogous to opening a textbook, and leaving the open book on the kitchen table all day. The site log would show the book being open, but only the student would know how long the book was actually used.

We asked the students whether the electronic resources contributed to their learning. With virtual unanimous decree, 33 of 34 responding students states that the learning resources contributed to learning. Knowing that every course exam used several images from the resource set, we asked whether we had measured, by way of exam questions and course grade, each student's use of the electronic resources. The majority of students, 25 of 34, responded No. That answer was independent of achievement, so even our good students did not feel that studying the

TABLE 1
Breakdown of Grades by Year for Survey Respondents

	1997 (N=34)	1998 (N=35)
Honors	7	11
High Pass	11	10
Pass	14	14

TABLE 2
Level of CD-ROM Use

	None		1-2 Hours		2-5 Hours		> 5 Hours	
	1997	1998	1997	1998	1997	1998	1997	1998
Honors	1	1	0	4	2	3	5	2
High Pass	4	1	0	5	2	3	7	1
Pass	2	2	0	5	3	2	7	5
Total	21%	12%	0%	41%	21%	24%	57%	24%

1997 and 1998 (N = 32 each year) out of a total of 144 students in each year.

TABLE 3
Level of Web-Site Use

	None		1-2 Hours		2-5 Hours		> 5 Hours	
	1997	1998	1997	1998	1997	1998	1997	1998
Honors	0	7	1	1	2	4	4	1
High Pass	0	4	2	2	6	0	5	2
Pass	1	7	2	3	4	0	5	1
Total	3%	56%	16%	18%	37%	12%	44%	12%

1997 and 1998 (N = 32 each year) out of a total of 144 students in each year.

actual exam images helped them answer exam questions. This is indeed a humbling answer. However, year after year the students always tell us that the best correlation between their individual achievement and their time spent with resources is greatest for time spent studying old exams. When asked whether they would do as well on exams by studying actual glass slides, as opposed to the images in the computer, the overwhelming majority, 23 of 34 responding students, opted for the images. Of the 34 responding, 23 admitted to feeling "very uncomfortable" about the prospect of taking a lab exam without access to the electronic resources.

The web logs provided us with three data plots (Figures 1-3). Figure 1 shows typical site utilization data in one 24-hour cycle, where 00 indicates midnight, and 23 indicates 11 PM. The graph plots "hits per hour", or individual web page requests, per hour, over a one day cycle. The plotted data represents only local medical student use, with filters to block recording the apparent heavy use from off-shore medical schools. As one would expect, the site is commonly accessed at night, most frequently the night before the exam. Figure 2 shows typical weekly use, recorded as "hits per day," and shows remarkable student utilization on weekends. Figure 3 shows incredible exam-specific learning. Students were observed to be using the site right up until the exam. Heavy utilization immediately after the exam is attributed to students trying to check their answers on the exam.

DISCUSSION

In order to determine outcome or achievement of students using electronic learning resources, we have tracked utilization of the resources, and compared that utilization with final grades in the course. The data indicate that students at all levels of achievement use the resources, and become dependent on the resources for routine study. But, as previously reported by McLay, et al. (5) individual student achievement is not necessarily improved by the availability of electronic resources. Moreover, the results give insight into student study patterns, and support the concept that students rapidly adopt learning materials, if those materials are asynchronous and interactive.

Figure 1
Time of Day Web-Site Utilization by Students

Figure 2
Web-Site Utilization by Students by Day of the Week

Figure 3
Web Access on Test Day

REFERENCES

1. Klatt EC, Dennis SE. Web-based pathology education. Arch Pathol Lab Med 1998, 122: 475-9.

2. Beckner, ME, Hongzia M, Cutlip AC, Moul DE. Acceptance of image-based computerized medical information by medical students at West Virginia University School of Medicine. Pathology Education 1999, 24:9-30.

3. Hawley DA, Hood AF, Paulsrud J. Pathology Education Resource Laboratory Web Site at http://erl.pathology.iupui.edu, 1998.

4. Anderson GL, Vitali CM. Further experiences with group exercises using e-mail communication in pathology education. Pathology Education 1997, 22: 1-10.

5. McLay RN, Meihoff E, Clejan S. A web-page to teach pathology to second year medical students – successes, failures and lessons learned. Pathology Education 1998, 23: 34-45.

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Presented at the Group for Research in Pathology Education 2000 Summer Meeting, June 23, 2000, Indianapolis, IN

Modalities of Teaching Laboratory Medicine/Clinical Pathology in the 21st Century

How to Make the Most of Limited Options

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ABSTRACT

General changes made to the curriculum in most medical schools and, in particular, Tulane University School of Medicine, have been directed towards integration and problem-based learning. As a result, laboratory medicine (LM) has been completely left out or involved in only part of a few clinical vignettes. Third and fourth year clinical directors at Tulane expressed the view that medical students are not taught enough about the medically appropriate and cost effective use of laboratory tests, nor about interpretation of laboratory data. In preparing for a new LM course we determined that: 1) electronic information skills should replace excessive factual recall and lectures, 2) direct integration with other basic sciences and general pathology is a necessity, and 3) LM learning is best achieved in a contextual framework to assimilate effectively and retain concepts integrated with mastery of clinical reasoning. With these specific goals in mind, we devised five core principle lectures and a five-hour problem based-learning which included the use of laboratory tests, reference intervals, collection, pre- and post-analytical variables, mathematical logic, predictive values, and technology integrated in real clinical problems. The rest of the LM consists of integrated twenty-to-forty minute talks with other pathology blocks (e.g. in neoplasia – tumor markers, in cardiology – lipids, in liver block – liver panel testing, in reproductive pathology – pregnancy, neonatal tests). The student and faculty evaluations of LM were tabulated by asking fourteen questions in two surveys at the end of first and second semesters. The responses were very positive (68%), positive (30%), and negative (2%) in each category in the first year, when Laboratory Medicine was taught, and remained significantly the same in the next two years. Studies also indicated a strong, positive correlation between higher scores on final comprehensive examination, the USMLE Step 1 examinations, and average scores in the LM exams. A focus group and detailed comments concentrated on several themes: 1) usefulness of distributing objectives, hand-outs, and web material in advance, 2) value of student preparation and interaction in small groups for effectiveness of PBL's, and 3) usefulness of review sessions. Our results indicate that integrated laboratory medicine teaching is efficient, valid, reliable, and practical.

INTRODUCTION

Integrating the basic medical sciences with one another and with clinical experiences early in the curriculum was an important challenge at Tulane University School of Medicine in the last five years, and continues to be an evolving process. The Laboratory Medicine (LM) component of the Sophomore Pathology Course that was designed and implemented in the last three years is very different today from the time that this process of integration began and is also continuously evolving.

In 1994, a one month (46 hr) series of "classical" lectures existed in the Sophomore Pathology course that included infectious diseases, hematology, cytology, transfusion medicine, organ function, serum proteins, acid-base, electrolytes, tests in obstetrics, and genetics. These lectures were separated by four-to-six months in time from the anatomic pathology lectures on the same subject.

In 1995, general changes were made to the curriculum with general pathology "interdigitated" with Microbiology, Genetics, Pharmacology, and an Introduction to Medicine the first semester and Anatomic Pathology integrated with Pathophysiology in the second semester. In this process, clinical pathology disappeared from the curriculum, but for an integrated block of five hours of hematology – hematopathology. By design or default in 1996, integration continued with the introduction of some limited clinical cases (which included laboratory data) in the form of clinical vignettes, but without any formal teaching of laboratory medicine. At the end of the 1996-97 academic year, a survey of third and fourth year clinical directors showed a very negative opinion about the capabilities of medical students' being able to interpret or even understand laboratory data. We also noted a decrease in student performance in a pathology (shelf examination) and in the USMLE Step 1 examination that included clinical vignettes with questions about the laboratory data. Results on the USMLE prompted curriculum change resulting in adding back Clinical Pathology/Laboratory Medicine. As the knowledge of the USMLE Step 1 becomes more interdisciplinary, and more clinically oriented with problem solving questions in laboratory medicine, the instructional and departmental leadership strongly supported the reintroduction of laboratory medicine teaching. Thus, we were urged to construct a framework for a "new laboratory medicine mini course" into the integrated pathology – pathophysiology course.

COURSE DESCRIPTION

We presented to our faculty the rationale (Table 1) and principles (Table 2) for the "new" laboratory medicine mini course. We looked at the mastery of domain content depending less on information quantity, but mostly on its organization in schemata (network of concepts and facts). A resource in great demand, but in short supply, was time. It takes a significant investment of quality time and effort to develop and coordinate such a course before its implementation. During the operational phase, involvement of clinical faculty in addition to the clinical pathology faculty (only 2 people), and senior pathology residents was necessary. In addition to integration of content with general and anatomic pathology, it was also effective to integrate a variety of teaching and learning methods including self-learning tasks. These included: lectures, small group discussions, and computer assisted instruction. Standardized patients were also used to provide a variety of formats each appropriate to specific goals. Our perspective was that laboratory medicine, like many other facets of medicine, has been dramatically transformed by technology and this had to be underlined in each lecture.

In the first semester, we now have the core principles of laboratory medicine (Table 3). In total, 9 hours are added to the curriculum, whereas in the second semester we are completely integrated in the pathology and pathophysiology blocks with nineteen twenty-to-forty minute lectures (Table 4), part of a replacement of anatomical pathology hours with LM.

We consider the core principles a very important part for teaching about the medically appropriate and cost effective use of laboratory tests. These core principles are not an endless lists of facts, but rather a set of fundamentals as an introduction to the factual knowledge of laboratory medicine. In addition, this part introduces and establishes a number of key themes that feature prominently in the later part of the course and non-concurrently throughout the clinical years. Our hope is that by introducing these five themes early on, when students are most accepting and open-minded, they will begin to develop a framework of attitudes and principles about laboratory medicine and its place in medicine in general, as well as context in which they may place specific information that will follow.

TABLE 1

Rationale for a "New" Laboratory Medicine Curriculum

Information Management Precepts have changed:

Increased volume and accessibility of data

It is impossible to learn or teach everything in laboratory medicne. Therefore, electronic information skills should replace excessive fatual recall and lectures in laboratory medicine

Integration:

Cross-disciplinary in the clinical years

National licensing has adopted interdisciplinary evaluation criteria with laboratory medicine as a huge part of certification. Therefore, direct integration of laboratory medicine with other basic sciences and general and anatomic pathology is a necessity.

Laboratory Medicine learning is best achieved in a contextual framework which effectively assimilates, and retains concepts and skills integrated with mastery of clinical reasoning.

TABLE 2

Principles of the "New" Laboratory Medicine Course

Should be a continuum

Active integration with basic and clinical sciences

Flexibility

Self-directed electronic life-long learning

TABLE 3

Overview of Laboratory Medicine/Clinical Pathology Curriculum

Core principles: 4 lectures, 5 hr PBL (problem-based learning) laboratory - electronic

Introduction to clinical pathology (use of laboratory tests, reference intervals, collection, difference between plasma-serum, pre-analytical, analytical (age, sex), post-analytical variables.

Mathematical logic (sensitivity, specificity, predictive values, prevalence, manipulation of reference intervals) with real clinical problems.

Urinalysis, CSF examination

Proteins

Molecular pathology, technology of medicine

Specimen collection (venipuncture) case studies in laboratory medicine - PBL of 5 hrs in 20 groups, assignments one month in advance, students as discussion leaders.

TABLE 4

Overview of Laboratory Medicine/Clinical Pathology Curriculum 2nd Semester

Interactive systems and disease: 19 hrs lectures, 2 PBL/computer labs.

Chronic, acute inflammation block: lab diagnosis of inflammatory disease

Microbiology block: a) mechanisms of infectious disease, b) clinical virology, c) case studies-infectious disease

Environmental pathology block: toxicology, heavy metals (also Pharmacology-toxicology lab)

Genetics block: prenatal diagnosis

Neoplasia block: a) molecular aspects of neoplasia, b) viral carcinogenesis, c) immunological aspects of neoplasia-tumor markers

Cardiology block: lipids, cardiac profile (PBL-tutorial)

Renal block: pathophysiology: sodium, potassium, acid base disorders (3 hr lectures + PBL)

GI/Liver block: a) GI lab tests, b) lab evaluation of liver disease, c) hepatitis testing

Endocrine block: pituitary, thyroid, parathyroid, ($^{+}$Ca + vit. D), adrenal, diabetes tests, PBL (5 hrs + 4 hrs PBL)

Reproductive pathology: Website lecture – pregnancy, neonate lab tests

Website tutorials, laboratories (neoplasia, hepatology, pancreas, clinical cases with lab data and questions for interpretation, differential diagnosis).

Website comprehensive reviews.

At the beginning of each class, the objectives (Table 5) are discussed. Also, most lectures begin with a problem or clinical vignette which make the case for the information provided in the lecture and ask questions which students answer at the end of the lecture. For example, in the lecture on mathematical logic, a case of digitalis intoxication is presented (modified from (1)). The problem is solved after the students learn to calculate positive predictive values. One of the most heated discussion(s) is provoked by the teacher in this interactive lecture: to test or treat? Students make their own decision tree and then discuss what option to use (taken with modification from (2)). The most popular and well-attended part of the course in the first semester is the specimen collection – PBL of 10 cases in laboratory medicine. This is at the end of the semester (after exams), split into two days, with one-half of the class (75 students) attending each day. The big group is then divided into 10 small groups and assigned two cases to solve and present in class. Each group will rotate to the hospital laboratory for one-half hour to practice venipuncture techniques, while the remaining groups discuss the cases that were assigned at least one month in advance. The cases are also available on the Website. The two faculty involved serve as guides, whereas the students collect the data, find the sources for differential diagnosis, discuss between themselves, and present the final diagnosis. This process leads to the acquisition of facts in relation to patient problems and in the process of problem solving. Thus, the process of storage and retrieval of information together with skills for locating and retrieving information from other sources helps students develop hypothetical – deductive strategies for diagnosis and management decisions on evidence based laboratory medicine. The basic scaffolding for the 10 cases are modified from (3).

The second semester in laboratory medicine is very intensive and integrated vertically and horizontally (See Table 4). To help achieve the integration, the order of the lectures is matched closely to the instruction in the organs and systems taught in close collaboration with the clinical departments. This part does not emphasize detailed information on individual tests as this may be obtained from reference books, from the Website (each lecture with additional tables, figures and details are posted on the Website at least five days in advance) or from the hand-outs (also given five days ahead). These assignments not only force students to use their computer skills, but also begin to emphasize the importance of learning interpersonal communication skills in laboratory medicine. We found very positive views on receiving orientation to the lectures prior to the class.

As an example, in the Liver block (8 hrs + PBL) we had two lectures of forty minutes: 1) laboratory tests for disorders of the liver and gallbladder, and 2) hepatobiliary dysfunction, bilirubin and serum serologic studies. Students have these lectures on the Website (enriched with additional figures) plus a “guidelines for a clinical approach to the patient with abnormal lab liver tests” and a handout with medical vocabulary for the lecture and specific objectives for what the students are expected to know. For these lectures, we consulted extensively with a hepatologist on clinical faculty to help determine the most clinically relevant information. We presented liver function tests in specific indexes: necrosis, cholestasis, excretory, severity, immune and tumor marker index (4). Short recall exercises and quizzes are added on the Website after each class. Students may complete them at the time following the lecture or only before the examination for the block. The multiple format questions on each examination are integrated. They are written in a clinical vignette format with 3 to 4 different questions. The laboratory medicine may be inferred in one or two questions, but laboratory data are always given with the vignette. At the end of the second semester, we have two more PBL’s with complex cases, and a review of the complete year’s material. The role of the PBL leaders is to ask questions, but mostly to help with resolution of different issues that arise out of the groups’ deliberations. In the last two PBL sessions, students had their exposure to

TABLE 5

Foundations (General Principles) of Laboratory Medicine Objectives

By the end of the block, students will be able to:

Understand the use of laboratory tests in clinical practice.

Define the sensitivity, specificity, reliability, and accuracy of a laboratory test.

Define the predictive value of positive and negative test results and how they vary with changes in the prevalence of disease.

Understand the meaning of the reference interval of a test and how it is manipulated to increase the test's sensitivity and specificity.

Understand the principles of anticoagulation in blood collection tubes and the differences between plasma and serum.

Define and give examples of pre-analytical, analytical, and post-analytical variables that affect laboratory tests.

Understand patient factors that alter test results such as age, sex, habits, and underlying disease.

practice skills of oral communication and self and peer assessment, which proved to be important to successful group dynamics.

COURSE EVALUATIONS

The evaluation of the Laboratory Medicine was done separately from the overall Pathology-Pathophysiology course evaluation. It consisted of polling students (using a questionnaire and a focus group session). The questionnaire presented 14 key statements related to the organization and delivery of the Course, and asked students to rate their agreement on a scale of 1 to 5 (1 = disagree, happened infrequently to 5 = strongly agree, to a very great extent). Students completed the survey and most of them added detailed comments. A focus group involving 10 randomly selected students provided greater insight into the perspective of the students. Following the pilot course in 1997, 128 respondents from a class of 150 students evaluated laboratory medicine as the most popular part of the sophomore pathology course. Again in 1998, the laboratory medicine part of the course received a good evaluation (4.2) from 116 respondents (See Table 6). Specific suggestions were made regarding sessions to add, delete, or modify which were incorporated into the 1999 version of the course.

We also have three years of data showing the meaningful sets of connections formed from the specific PBL case(s) experiences. These data also showed that the cases are later used with success in the clinical years. Several themes emerged from the detailed comments: 1) the usefulness of distributing objectives, hand-outs and website material in advance, 2) the value of student preparation and interaction in the small groups for effectiveness of PBL's, and 3) the usefulness of old examinations, quizzes, and review sessions. One problem developed regarding specific lectures in which too much material was covered. This was discussed with the faculty who expressed difficulty knowing what to leave out. Most students were delighted with the lectures in a mixed format and the pace (quote from a student: "I found that I learned what I needed to know, but it didn't take me hours to figure it out").

The impact of our laboratory medicine centered curriculum on long-term retention of medical knowledge was investigated by comparing the academic achievement with that from previous years when the laboratory medicine/clinical pathology was not taught (Table 7).

Measures of academic achievement included student performance on a multiple choice final comprehensive examination (Table 8) and a detailed report in laboratory medicine questions from this academic year (Table 9). Scores on the laboratory questions increased significantly from year to year, compared with previous years (1995-96, 1996-97). Scores on the final comprehensive examination increased significantly in the year in which laboratory medicine was extended and laboratory PBL's were introduced and was also significantly higher than the national average (1997-98). Also, scores on the pathology section of the USMLE Step 1 increased significantly year after year (after academic year 1997-98). These data suggest a link between teaching and evaluation on the one-hand and learning on the other. We infer that our laboratory medicine-centered curriculum may make learning and answering clinical vignette type questions more efficient. Our results indicate that integrated teaching based on laboratory medicine is valid, reliable, and practical.

CONCLUSIONS

The challenges encountered during reform of clinical pathology/laboratory medicine as part of integrated sophomore pathology were: a) working through a consensus to remove resistance to change, b) negotiating consensus amongst faculty regarding content, sequencing and type of educational experience in laboratory medicine; c) maintaining departmental control, d) continued involvement of Medical Student Body, and e) recruitment of incoming class prior to completion and planning of the new clinical pathology.

TABLE 6

Evaluation by Student (1997 - 1999) of the Laboratory Medicine
(Mean Scores on a scale of 1-5)

Year	# of Students Responding	Mean Score ± SD
1997	128	4.3 ± 0.6
1998	116	4.2 ± 0.4
1999	118	3.9 ± 0.7

TABLE 7

Relationship Between Mean Student Scores on Tulane Clinical Pathology Examination and Final Shelf Examination from 1995 - 1999

Academic Year	Lab. Med. Questions Aggregate (5 exams)	p	Final Shelf Exam Tulane Avg.	Final Shelf Exam National Avg.
1995-96	--		67.8 + 6.2	70
1996-97	72.5 + 5.4 (59)		73.5 + 5.6	70
1997-98	78.5 + 5.2 (70)	< 0.001	76.8 + 5.8	70 (b)
1998-99	82.0 + 6.1 (95)	<0.01	75.4 + 6.0	70

a) In parenthesis are N (number of questions) pertaining each year to Laboratory Medicine.
b) Students at Tulane scored significantly higher ($p < 0.05$) than the national cohort only in 1997-1998.

TABLE 8

Sophomore Pathology Course 1998-99 Final Shelf Exam

Topic	Tulane Avg.	National Avg.
MI – Cardiac profile	91%	90%
Anemia	85%	53%
Serology	83%	70%
LDH enzyme	83%	64%
Hematology values-radiation	82%	78%
Thyroid function test	77%	74%
Leukocyte Findings	75%	65%
Lab SIADH	68%	55%
Labs – adrenal adenoma	72%	70%
Blood smear	66%	51%
Lab – Rheumatoid arthritis	58%	58%
Lab – Ricketts	57%	62%
Hypoparathyroidism	56%	50%
(N=13) Clinical lab. Questions	73.3%	64.6%
(N=125) All questions	75.4%	70%

TABLE 9

Clinical Pathology Questions 1999-2000

	Topic	N	Class Average
Laboratory			
	Statistics	5	81%
	Inflammation	3	65%
	Urinalysis	8	87%
	E B Virus	2	75%
	CSF Analysis	4	89%
	Culture Specimens	2	68%
	Proteins	2	75%
	PCR	1	37%
	Tumor Markers	4	86%
	Lipids	3	87%
	Cardiac Profiles	1	99%
	Water, electrolytes, acid base	15	72%
	Hematology	28	86%
	Coagulation	7	87%
	Transfusion Medicine	3	72%
	Endocrinology	8	79%
	GI Liver	3	56%
	Total	99	

Class Averaged Based on Above ’99 Questions – 80%

We also hope to implement in the next academic year two key aspects for a truly efficient integrated laboratory medicine: 1) a return to pathology/laboratory medicine of at least 2 days during each clerkship rotation featuring utilization and interpretation of laboratory medicine, transfusion medicine, blood banking, etc.., and 2) case discussions and inter-disciplinary PBL sessions to supplement instruction on issues of professionalism and humanism in laboratory medicine.

REFERENCES

1. Cutler, P. Problem solving in clinical medicine. From data to diagnosis. 3rd Ed. Williams & Wilkins, 1998. Chapter 7, Digits, Decimals and Doctors, pp. 69.

2. Cutler, P. Problem solving in clinical medicine. From data to diagnosis. 3rd Ed. Williams & Wilkins, 1998. Chapter 7, Digits, Decimals and Doctors, pp. 79.

3. Goljan, E.F. Pathology. W. B. Saunders; 1998; Clinical cases in laboratory medicine, pp. 476.

4. Goljan, E. F. Pathology. W. B. Saunders; 1998; Clinical cases in laboratory medicine, pp. 338.

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The Impact of a Merger of Academic and Non-Academic Hospitals on Medical Education

Paul Biddinger, M.D. and Andrew T. Filak, Jr., M.D.

ABSTRACT

In 1994 the University of Cincinnati Hospital merged with a community hospital to form the Heath Alliance of Greater Cincinnati (HA). The HA grew to include four more community hospitals. The merger was initiated for financial reasons and while the HA has yet to generate an operating surplus, it has resulted in greater access to managed care patients for University Hospital. The HA assumed oversight for all graduate medical education and reviewed and rated all programs. Using data from the review, the HA has set goals related to the quality and financial impact of the residency programs. The College of Medicine remains independent from the HA and the impact on medical education has been minimal thus far. The academic faculty has experienced stresses and alterations of clinical practice associated with the merger that could adversely affect medical student education in the future.

INTRODUCTION

During the past decade, numerous hospital mergers have occurred in the United States (1-4). The mergers have involved many different types and sizes of hospitals. Mergers have occurred between teaching hospitals with varying degrees of success. Three high profile mergers include Massachusetts General Hospital with Brigham and Women's Hospital, New York Hospital with Presbyterian Hospital, and the University of California at San Francisco Medical Center with the Stanford University Medical Center. All three mergers appear to have been initiated primarily for financial reasons (5,6). The merger of Massachusetts General Hospital with Brigham and Women's Hospital, both teaching hospitals for Harvard, could be judged a qualified success at this time. The UCSF-Stanford merger, however, dissolved in 2000 after less than three years duration. The merger of New York and Presbyterian Hospitals has resulted in little integration between the clinical units of the Cornell and Columbia medical schools.

The merger of the main teaching hospital of a medical school with one or more community hospitals poses a number of challenges. The missions of these different types of hospitals overlap in many areas of clinical services but usually differ significantly in the value placed on education and research. The cultures of the clinical and administrative staffs are likely to reflect these differences in the values placed on service, teaching and research. Little has been published regarding the merger of an academic hospital with community hospitals. This article describes the merger that occurred between the University of Cincinnati Hospital and multiple community hospitals in the greater Cincinnati area and its impact on the education of residents and medical students.

THE MERGER

On February 14, 1994, a merger of the University of Cincinnati Hospital and The Christ Hospital was announced. The newly formed Health Alliance of Greater Cincinnati (HA) would be the administrative body of the two hospitals with the chief executive officer of The Christ Hospital becoming chief executive officer of the Health Alliance.

The University of Cincinnati owned and operated University Hospital at the time of the merger. The hospital traced its origins back to 1821 with the creation of the Cincinnati Commercial Hospital and Lunatic Asylum by Dr. Daniel Drake, a pioneering physician in the Cincinnati area. The hospital evolved into the general city hospital, and in 1962 the city transferred full operation to the University. In 1977, the University transformed from a municipal to a

state institution. At the time of the merger, University Hospital had approximately 500 beds and served as the primary teaching hospital for the University of Cincinnati College of Medicine.

The Christ Hospital is a private, not-for-profit hospital located approximately one mile from University Hospital. The Christ Hospital had over 400 operational beds at the time of the merger and provided a number of tertiary services. It was affiliated with the College of Medicine, serving as a venue for medical student training and a rotational training site for some university-based residencies. Many of the attending physicians and surgeons had volunteer faculty appointments in the College of Medicine.

Financial considerations were the prime reasons for merger. Before the formation of the Health Alliance, University Hospital had access to 7 percent of regional individuals covered by managed care panels. As of January 2001, the access rate had climbed to 91 percent. The Christ Hospital access rate rose from 73 percent to 91 percent. The Health Alliance also hoped to reduce costs by economies-of-scale and other means. In addition, the Greater Cincinnati area was perceived as having excess hospital capacity. Pressure existed to reduce the number of beds with closure of at least one hospital.

The Health Alliance evolved to include the Jewish Hospital of Cincinnati, two northern Kentucky hospitals, St. Luke East and St. Luke West, and Ft. Hamilton Hospital of Hamilton, Ohio. The Jewish Hospital subsequently closed operations at its urban location close to University and The Christ Hospitals and moved to a smaller, suburban location. Following the trend of merger, three other area hospitals merged in 1995 to form TriHealth and nine others merged in 1996 as Catholic Healthcare Partners.

University Hospital experienced a significant change in status in 1997 when it underwent privatization. As a state institution, University Hospital operated under regulations different from those of the other area hospitals. These regulations were perceived as more constraining and costly. In addition, the University Board of Trustees desired freedom from the financial responsibility of the hospital. After a period of spirited public debate and legal maneuvers, the University Hospital became a private, not for profit entity under the administration of the Health Alliance.

The Health Alliance became the fourth largest employer in the Greater Cincinnati area with over 11,000 full-time equivalent positions. The annual operating budget exceeds one billion dollars. It has experienced consistent operating losses since its inception despite significant cost reductions. However, the rate of loss has been decreasing and the HA has potential to show a profit during the current fiscal year.

One of the early initiatives of the HA was consolidation of the clinical laboratories. The Jewish Hospital was chosen as the site of the main consolidated lab with residual immediate response labs remaining at the other hospitals. The consolidation had significant impact on the University of Cincinnati Department of Pathology and Laboratory Medicine. The Department experienced the sudden loss of all clinical pathology reference business and more than 1.5 million dollars of annual revenue. The Department also lost control of human and equipment resources, a number of laboratory directorships, talented faculty who accepted other positions, and venues for resident education.

Effects of Merger on Medical Education

The effects of the merger have primarily been in the area of graduate medical education. The three HA hospitals with training programs - University, The Christ and Jewish - have a total of 48 training programs with approximately 600 residents and fellows. University Hospital has a full spectrum of programs while The Christ Hospital has residencies in internal medicine and the Jewish Hospital in internal medicine and general surgery. The HA is the paymaster of these residents and fellows.

All programs are now integrated or affiliated with the College of Medicine.

In 1999, the HA hired a former executive vice president and dean of a medical school (not located in the same region of the country) to serve as vice president for education and research. This individual received a joint appointment as an associate dean of the College of Medicine and was given responsibility for graduate medical education (GME). The position is accountable to the CEO of the HA and the Dean of the College of Medicine.

The Vice President for Education and Research (VPER) formed a GME planning committee in November 1999. The committee has sixteen members including the Associate Dean for Medical Education, directors of all internal medicine and surgery programs, and a senior HA financial officer. The VPER serves as chair of the committee. The committee reviewed and rated all 48 training programs using specific criteria. These criteria included external and internal reviews, competitiveness of the applicant pool, faculty and facility resources, service needs of the institution, examination performance, scholarly activity, record of job placement, workforce needs, and relationships between residents and faculty. The process built upon efforts to achieve correct sizes of programs developed at University Hospital in the mid-1990's.

The HA developed a number of goals for GME as a result of the review and other activities. The goals are: 1) program integration leading to economies-of-scale with cost reduction, 2) recruitment of the maximal allowable number of trainees in a manner that maximizes reimbursement, and 3) the freeing of training positions to allow for expansion or modification of certain programs. The HA intends to develop a financial plan that reflects revenues and expenses, and the contribution of residents to income generation. The HA also stated the desire to attract more graduates of U.S. medical schools.

To achieve their goals, the HA proposed a number of initiatives in the year 2000. The initiatives include integration of internal medicine programs, integration of general surgery programs, development of core curricula, use of outcomes measures, oversight of the match program, financial planning and budgeting for the programs, encouragement of resident research, and internal review of programs with revisions as indicated. Due to the relatively recent development of these goals and initiatives, the overall impact on GME is yet to be seen. In particular, full integration of the medicine and surgery programs has met with considerable resistance.

The impact of the merger and formation of the HA on residency training in pathology has been a mixture of positive and negative effects. Most of the positive effects have been due to exposure to more specimens in the clinical laboratories. For example, approximately 70 percent of flow cytometric analyses performed in the Greater Cincinnati area are performed in the HA Immunology Laboratory. This consolidated laboratory also was placed under the directorship of a College of Medicine faculty member with a strong commitment to teaching, and the overall resident experience in flow cytometry improved. Consolidated laboratories with a new director, who did not derive from the academic sector, tended to be sites with decrement in resident education. Relatively heavy workloads for technologists in the consolidated laboratories also had a negative effect on education.

The effects on anatomic pathology training were less. The anatomic pathology services of the HA hospitals remain separate entities although most non-pathologist personnel are now employed and supervised by the HA. Pathology residents do not rotate to HA hospitals other than University Hospital, and hence they have not been exposed to a greater number and variety of specimens, or to the non-academic practice of anatomic pathology.

The effect of the merger on medical student education has been minimal thus far. The College of Medicine remains a separate entity and its funding is not depen-

dent on the HA. The main positive aspects are that the College has less financial liability since the privatization of University Hospital, and that University Hospital has remained viable as the main teaching hospital. Had it not gained greater access to managed care patients, University Hospital likely would have suffered in terms of patient mix and reimbursement. The negative aspects have largely been faculty "wear and tear" and difficulties with recruitment of new faculty and chairpersons.

DISCUSSION

The merger of two or more hospitals is an event that can disrupt many established operational organizations and patterns of medical practice. A merger between a medical school's main teaching hospital and other hospitals poses challenge for medical education, particularly when the new administrative authority is outside the academic institution. The merger that formed the Health Alliance of Greater Cincinnati has had positive and negative effects over its seven-year life span, and its full impact is probably yet to be determined.

The HA has succeeded in keeping the University Hospital a viable tertiary care center where education of medical students, residents, and fellows continues. What the status of University Hospital would be had the merger not occurred is a matter of speculation. Some evidence suggests it would have evolved into a mostly indigent care hospital with many scaled back services. The control of graduate medical education by the HA has been accomplished by more critical oversight of programs at the University Hospital and the two community teaching hospitals that sponsor programs.

A number of problems and potential pitfalls have become apparent. Financial issues have preoccupied the HA and overshadowed education. The HA has made minimal investment in scholarship and research. The merger of academic and non-academic practice groups has tended to draw academic physicians to the private practice end of the spectrum and provide them with disincentives to teach. The College of Medicine is independent from but closely related to the HA. The HA cannot, as currently constructed, meet all the needs for medical student education. The HA has a somewhat preferred status, but student placements are based on the educational qualities of the rotation sites. The HA has also adopted a "product line" management approach to a number of areas of health care delivery. The possibility exists that a service could be consolidated at one hospital, with diminished opportunities for medical student education.

The lessons we have learned are financial considerations were the main reasons for the merger and are the main driving force behind its management. Mergers involve humans and mergers have the potential to bring out the best and worst of human qualities. Coping with the changes and added demands of a merger are stressful. One should anticipate increased wear and tear among faculty and other staff, and take steps to cope with these problems.

Gaining an historical perspective can be helpful, particularly if the institutions have evolved through mergers in the past. The University of Cincinnati College of Medicine is a product of a number of mergers that occurred since its founding in 1819. The merger that formed the existing college occurred in 1909, the same year it was visited by Abraham Flexner. At this time, the city was building a new hospital that eventually opened in 1915, the hospital that would serve as the primary teaching hospital for the remainder of the century. Flexner wrote "The university has so recently obtained complete control that it is not fair to make an inventory of the situation at this moment in a critical spirit. A modern outfit adequate to routine teaching has been already installed in pathology, bacteriology, and physiology. The subjects are taught by whole-time modern teachers . . . (Clinical facilities) are likewise in a state of transition, not only because of the recent formation of the department, but further, because the city has just begun the erection of a new hospital, whose exact relation to the university remains to be determined.

There is an apparent disposition to make the relation close enough to be educationally effective." (7) This assessment of the College of Medicine and its relationship to the hospital in ways parallels that between the College and the Health Alliance. How this current relationship will evolve is a question unanswered at this time.

REFERENCES

1. Japsen B. Another record year for deal making. Activity among medium-size companies fuels continued drive toward consolidation. Mod Healthc 1996, 26:37-46,

2. Lumsdon K. Deals that went down the drain. Hosp Health Netw 1996, 70:20-24.

3. Bellandi D. Mergers and acquisitions. Spinoffs, big deals dominate in '99. Mod Healthc 30:36-44, 2000.

4. Carrol J. Mergers, acquistions afoot in disease management industry. Manag Care. 2000, 9:30-34.

5. Kastor JA. Mergers of three teaching hospitals: three case studies. Am J Med 2001, 110:76-9.

6. Andreopoulus A. The folly of teaching-hospital mergers. NEJM 1997,336:61-4.

7. Flexner, A. Medical Education in the United States and Canada. Merrymont Press, Boston, 1910.

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Initially presented at Group for Research in Pathology Education Winter Meeting, January 2001, Grenada, West Indies.

Contributions of Pathology Faculty to Integrated Biomedical Graduate Programs

Allan J. Yates, M.D., Ph.D.

INTRODUCTION

For decades graduate education in the College of Medicine and Public Health at The Ohio State University was administered by several departmentally based, degree granting graduate programs, one of which was Pathology. However, there were many reasons that the faculty and administration decided to merge these programs into one college-wide Integrated Biomedical Science Graduate Program (IBGP) with the theme "Biology of Human Disease." Some of the many advantages to doing this include: (a) pooling of resources for recruiting and administration, (b) larger graduate faculty with broad range of research interests, (c) facilitation of interdisciplinary training of graduate students, and (d) development of efficient, integrated core curriculum appropriate for students interested in studying human disease. Initially, there were concerns expressed that many faculty in the Department of Pathology would not be able to play a significant role in a large, college-wide, interdisciplinary graduate program like this. However, with the first class of 21 excellent students beginning summer quarter, 2001, it is clear that faculty in the Department of Pathology have made, and will continue to make, major contributions to the IBGP. The following discusses some of these contributions.

ADMINISTRATION

Graduate Studies Committee

There are two IBGP committees that have extremely important administrative functions: the Graduate Studies Committee (GSC) and the Recruiting Committee. Both committees are composed of a representative from each of the participating departments (Pathology; Molecular Virology, Immunology and Medical Genetics; Pharmacology; Physiology and Cell Biology; Neuroscience; Molecular and Cellular Biochemistry; Biomedical Informatics). In addition to establishing and overseeing policies that govern the IBGP, the GSC is responsible for all issues pertaining to the curriculum, and thereby functions as a Curriculum Committee. Through its GSC representative the Pathology faculty have had significant input into the development of policies and curriculum of the IBGP. However, this has required that the departmental representative (or alternate) attends all meetings of the GSC, reports issues to and solicits input from the Pathology faculty in a timely fashion, and conveys the ideas and concerns of the department in an effective manner at the meetings of the GSC. This has been of considerable advantage not only to the Department of Pathology in protecting its interests in the program, but also to the IBGP by providing the extremely valuable perspective of Pathology during the development of critical issues such as curriculum.

Recruiting Committee

The Recruiting Committee has the very important function of developing recruiting materials and disseminating information about the IBGP to potential students. During its first year it has been obvious that the major concern of all members of this committee is to attract students who have the highest chance of becoming successful independent researchers. However, in a graduate program with the theme "Biology of Human Disease," Pathology faculty members provide a unique dimension in discussions with prospective students about the causes, pathogenetic mechanisms, diagnosis and therapy of human disease. Tours of research and clinical laboratories in the department are always of interest to students with an interest in studying human disease who are visiting the graduate program.

Student Research

Beginning with the first quarter students work in the laboratories of graduate faculty. During the first year these are usually for one quarter at a time as laboratory rotations, in which the students learn specific techniques and become familiar with potential dissertation advisors' research. The IBGP provides the student's stipend and arranges for a tuition waiver for the first four quarters, so the faculty members have no financial obligation to students rotating through their laboratories other than for research supplies. Because the research of pathology faculty is almost always related to some aspect of human disease, rotations through their laboratories can be extremely useful to these students even if the student does not choose that person as his/her dissertation advisor.

By the beginning of the second year the student must have chosen a dissertation advisor. In addition to guiding the student through his/her dissertation research, this faculty member must provide a stipend, facilities, and funds for the student's dissertation research during the duration of doctoral studies. This is a major obligation that not all faculty members can fulfill. However, even for those who cannot be dissertation advisors, there are opportunities to participate in this phase of a graduate student's education. One way that this can be done is by serving on a student's Dissertation Advisory Committee. Although this committee only meets with the student twice each year, committee members can have a major impact on the direction and success of the student's graduate education, both through direct counseling and collaborative research with the student.

With the theme "Biology of Human Disease," it is not surprising that many of the students want to work on research projects that will require human specimens. This inevitably involves the cooperation of faculty within the Department of Pathology who can facilitate the acquisition of appropriate material. It also provides an opportunity to teach the student about important issues related to the acquisition, storage, and distribution of specimens. Such issues include: information about requirements and approval of Institutional Review Boards, accuracy of diagnosis, quality control, effects of clinical factors such as treatment on the specimens, obtaining associated clinical data without using linked identifiers, etc.

Seminars

Pathology faculty can contribute to several different types of seminars that are organized as part of the IBGP curriculum. During the first quarter (summer) there is a twice-weekly, one hour long session for all first year students at which faculty give fifteen minute summaries of their research, and describe opportunities in their laboratories for student rotations and dissertation research. The main IBGP research seminar occurs during each of the other three quarters as a weekly one-hour presentation that will be attended by all graduate students and many faculty. Eighteen of the twenty-four presentations each year will be by IBGP graduate faculty members and the other twelve by outside speakers. Additionally, all of the tracks must organize a weekly seminar. The format of these will vary among the tracks; some will be journal clubs, others will be more formal presentations by students, and the speakers at others will be mainly faculty and outside guests. However, regardless of the format, participation by Pathology faculty will be most welcomed in all of these seminars for their understanding of various aspects of human disease.

CONCLUSIONS

There is a current trend in medical centers to form integrated, or interdisciplinary, interdepartmental graduate programs. Being based in medical centers, the main emphasis of these programs is often directed towards investigating human disease. The Integrated Biomedical Science Graduate Program (IBGP) at The Ohio State University is an example of such a graduate program with which the departmental graduate program in Pathology recently merged. Rather than reducing and restricting the

Admissions Committee

The Admissions Committee is composed of all members of both the GSC and Recruiting Committee. This committee has the critical task of constructing the student composition of each class. By actively participating in recruiting activities, the Pathology representatives can make a major contribution to selecting the most promising students by providing information that they have obtained about the candidates during the recruiting process. These activities are quite varied and include traveling to undergraduate colleges to represent the graduate program, accepting undergraduate students into their laboratories for research experiences, personal contact with individual undergraduate students by telephone and e-mail, and interviews on visitation days.

Tracks

After the first year in the graduate program, students enter one of several formal tracks that will guide them during their dissertation research and provide them with in-depth educational opportunities related to their areas of interest. Any group of faculty can form such a track with a theme that is appropriate to the IBGP, but it is strongly encouraged that these be interdisciplinary and composed of faculty from several different departments. Examples of these tracks are "Immunology," "Oral Pathophysiology," "Neurobiology of Disease," and "Molecular Virology and Gene Therapy." Faculty membership is not restricted to a single track, and several Pathology faculty are participating in more than one track. Each track requires an administrative structure, and Pathology faculty are contributing at several levels; one member has proposed a track that he will direct. It is planned that each of these tracks will ultimately receive funding for their students through a N.I.H. Training Program Grant. As each of these tracks is related to some aspect of human disease, the participation of Pathology faculty in the writing and administration of these grants will be a valuable resource that will contribute to the success of the track.

TEACHING

Classroom Teaching

There is ample opportunity for Pathology faculty to contribute to teaching in an integrated biomedical graduate program. Students enter the IBGP at the beginning of summer quarter, during which they take a course entitled "Research Techniques and Resources." The two co-directors of this course are faculty members in the Department of Pathology. As part of this course the students are given the opportunity to observe an autopsy and are shown the surgical pathology facilities to see how the Tissue Procurement Service operates. Clinical pathologists give them a tour of the hospital's clinical pathology laboratories. These sessions make them aware of how human research specimens are obtained, and what facilities and instrumentation are available for collaborative research that are not as readily available outside of a major medical center with pathologists participating in graduate education.

The major course of the core curriculum involves two class hours per day for five days each week, and extends over three academic quarters. The goal of this course is to present the biological mechanisms that lead to human diseases at several levels of organization. It begins with biochemical, molecular and genetic mechanisms, and progresses through the cellular, tissue and organ levels to integrated organ systems and clinical aspects. While non-pathologists teach most of this course, the theme of the IBGP, "Biology of Human Disease," makes the participation of pathologists essential for certain parts of the curriculum. Throughout the course there are presentations by pathologists on histopathological aspects of specific diseases and disease processes. In addition, two pathologists play major roles: one directs a module entitled "Host Defense," and another presents detailed, completed autopsies in the module, "Clinical Research."

participation of Pathology faculty members in graduate education, this merger has provided a wide range of opportunities for them to participate on a larger scale than previously available in a smaller departmental graduate program (Table 1).

Detailed information about the IBGP can be viewed on its website at www.ibgp.org.

TABLE I

Contributions of Pathology Faculty to Integrated Biomedical Graduate Programs

Area of Contribution	Pathology Faculty Participation
Administration	Graduate Studies Committee Recruiting Committee Track Development Provide Stipends and Tuition through Research Grants Submission and Administration of Training Program Grants
Teaching	Curriculum Development Course and Module Coordinators Lectures, Lab Demonstrations, Seminars Research Rotations
Student Advising	Precandidacy - Advisor or Committee Member Dissertation Research - Advisor, Committee Member or Collaborator
Other Activities	Recruiting Facilitating Interactions with Clinical Laboratories Facilitating Acquisition of Human Specimens Provide Expertise on Mechanisms of Human Disease

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MINUTES OF THE GRIPE BUSINESS MEETING
Indianapolis, Indiana

Summer 2000

Call to Order:

Dr. Regina Kreisle, Vice-President, called the business meeting of the Group for Research in Pathology Education (GRIPE) to order at 3:38 p.m. on June 23, 2000 at the University Place Conference Center on the IUPUI campus. Dr. John Holliman conducted the meeting.

Minutes of the Last Meeting:

The minutes of the New Orleans meeting (Winter 2000) were approved as written without addition or deletion.

Report from the President:

No report was given.

Central Office Report: (Dr. John Holliman, Executive Director)

The financial report (7/1/99-5/31/00) was presented. GRIPE ended this period with a balance of $80,606.63. Income for this period was $59,939.43. Expenses were $60,819.42. Dr. John Holliman pointed out that some additional income is expected to be received prior to the end of the fiscal year. It is anticipated that this meeting (i.e. Summer 2000) will break even. This would indicate that GRIPE should break even for the entire 1999-2000 fiscal year.

Dr. Holliman pointed out that the GRIPE list serve is still down. He has been in communication with Dr. Joe Price at Oklahoma State University. OSU has apparently switched operating systems. It is hoped that the list serve will be up again soon. If members have information that needs to be sent to the entire GRIPE membership, they should forward the information to Dr. Holliman for email dissemination.

Committee Reports:

A. Objectives Committee (Dr. John Holliman for Dr. Roger Geiss, Chair):

The committee did not meet at this meeting. However, the committee is progress ing with its work outside of the meeting.

B. Multiple Choice Bank (Dr. James Dixon, Chair):

The committee met on June 21, 2000 and reviewed 287 items; 154 of these questions were accepted for the question bank. Almost all of these questions were clinical vignettes. Dr. Dixon indicated that the lab medicine and blood system portions of the bank were still weak. Additional clinical vignettes are needed.

C. Software and Technology Committee (Drs. Patsy Lill and Regina Kreisle, Co-Chairs):

The GRIPE materials will be distributed on CD. The CD will include several versions of the GRIPE database including FileMaker Pro and stand alone versions. The committee discussed placing 72 dpi images onto the CD. The CD will include the GRIPE question set. A suggestion was made that the CD should also include the email and institutional addresses of GRIPE members.

The photo bank archives will continue to be kept on photo CD's. The highest quality setting preserves more future options (e.g. creation of an atlas). The distributed images will continue to be at 512 x 768 pixels, a resolution adequate for projection.

The committee felt that less-than-perfect images should be accepted into the GRIPE collection if the image filled a need. Such an image could then be digitized, processed, and placed on the CD. However, such restored or improved images should be so marked. It was decided by the Executive Committee that only original slides should be submitted to Iowa for the kodachrome set.

The upcoming GRIPE-sponsored course directors' workshop may include possible talks on Photoshop and image manipulation.

The issue of images appearing differently on various monitors and systems was addressed. Dr. Lill had spoken with Dean Hawley of Indiana University about possible calibration of color bars with paper standards.

Dr. Bob Lee asked if the image bank was accepting digital images. JPEG images of sufficient resolution (at least 512 x 768) will be accepted.

D. Photo Committee (Dr. John Holliman, Chair)

The Photo Committee discussed many of the same issues that the Technology Committee had discussed.

Approximately 50 questions of images were evaluated and accepted at this meeting. Additional questions with accompanying images are needed. Accompanying performance data is also requested.

E. Case History Bank (Dr. Barbara Bosch, Chair)

This committee will be dissolved. Other forums now exist for submissions of cases.

F. Journal (Dr. Chuck Hitchcock, Editor)

The latest edition of Pathology Education will be distributed within a few weeks. The administration and publishing of the journal have been completely transferred from Nebraska. It is hoped that turnaround time can be cut from 12 months to 6 months. The journal will continue to be peer-reviewed.

Dr. Hitchcock reminded GRIPE members that all projects involving students (e.g. performance data) constitute human experimentation. Local IRB approval is thus needed. Dr. Regina Kreisle has written an article on this subject for Pathology Education.

G. Nominating Committee

A nominating committee has been appointed to nominate a slate of officers for election at the Park City meeting. The members of the committee are as follows:

Dr. Patsy Lill, Chair
Dr. Frank Sharkey
Dr. Phil Conran
Dr. John Holliman

Nominations will be accepted from the membership.

Future Meeting Sites:

A. Winter 2001

The Winter 2001 meetings will be held January 10-13, 2000 in St. George's, Grenada. Dr. S. Bhusnurmath will be the host. President Geiss is looking at several hotels. Members were told that although passports were not required, it would be best if they had one. Members were encouraged to apply for a passport within a short period of time due to the time needed for processing.

B. Summer 2001

The Summer 2001 meeting will be held in July 2001 in Park City, Utah in conjunction with the APC/PRODS meeting. The New Course Directors' Workshop will be held. Dr. Bob Boorstein, course director, asked for input and suggestions from the GRIPE members. Dr. Boorstein indicated that a draft of the program is needed by July for presentation to the APC.

C. Winter 2002

The Winter 2002 meeting will be held in Tampa, Florida and will be hosted by the University of South Florida and Dr. John Balis. Dr. Balis indicated that this would be a good time for GRIPE to visit USF; this meeting will follow the LCME visit. The curriculum is being reevaluated for more integration. He anticipates having a skeleton program by the winter meeting.

Old Business:

Tom Kent Award

Forms for nominations are available. Nominations need to be made by individuals from 3 institutions. Two additional nominations are needed. The committee is composed of the last 4 GRIPE presidents. There were no official nominations last year.

Dr. Kreisle added that it would be good for GRIPE if we could make an award at the joint APC/PRODS/GRIPE meeting.

New Business:

A. Web-based distribution:

1. Dr. Gerald Bartlett has retired. Emeritus membership for Dr. Bartlett was approved by the membership.

2. Dr. Fred Dick has received a National Library of Medicine grant to digitize a collection of 300 core histopathology slides. He has inquired about associating gross photos from the GRIPE collection with the digitized images. The images would be in the public domain. Dr. Bob Lee encouraged this use of GRIPE images. Dr. Sebastian Alston expressed copyright concerns. Dr. Kreisle said that such a use would be good advertising; the GRIPE logo would be on each photograph. Dr. Paul Biddinger said that he would love to have such a resource.

B. Future meetings:

Oklahoma City was suggested as the site of the Summer 2002 meeting. It was mentioned that Dr. Bertha Garcia had previously suggested London, Ontario.

C. Dr. Bob Lee will travel to the GRIPE central office to go through the GRIPE archives. Dr. Lee is planning to present the History of GRIPE at the APC/PRODS/GRIPE meeting in Summer 2001. This meeting will coincide with the 30th anniversary of GRIPE.

Adjournment:

The meeting was adjourned at 4:26 p.m.

Respectfully submitted,
Sebastian R. Alston, M.D.

MINUTES OF THE GRIPE BUSINESS MEETING
St. George's, Grenada

Winter 2001

Call to Order:

Dr. Roger Geiss, President, called the business meeting of the Group for Research in Pathology Education (GRIPE) to order at 11:31 a.m. on January 12, 2001 at St. Georges University School of Medicine, St. George's, Grenada.

Minutes of the Last Meeting:

The minutes of the Indianapolis meeting (Summer 2000) were approved as written without addition or deletion. The motion was made by Dr. Frank Sharkey and seconded by Dr. Charles Hitchcock. Approval was by voice vote.

Report from the President:

Dr. Geiss made welcoming remarks and thanked Dr. Bhusnurmath for hosting the meeting. Dr. Bhushnurmath then thanked others for their assistance.

Central Office Report: Dr. John Holliman, Executive Director

The financial report (7/1/00-current) was distributed to the membership as attached. Dr. Holliman reported that he had spoken to the executive committee about shifting the financial reporting to calendar year from fiscal year. This would make it easier to compare years. He indicated that he would check the bylaws. Dr. Frank Sharkey stated that such a change to calendar year reporting would make it tough to get data completed by the January meeting. He suggested that a fiscal year ending on 12/1 might be better. Dr. Holliman indicated that he will look back at the timing of expenses to evaluate this proposal.

Committee Reports:

A. Objectives Committee, Dr. Roger Geiss, Chair:

> The committee did not meet at this meeting. However, they are progressing with the work outside of the meeting. Drafts of objectives are being sent to content experts for review.

B. Item Bank Committee, Dr. Mike Lyons reported for the absent chair Dr. Jim Dixon:

> The committee met on January 10, 2001 and reviewed several hundred items. The committee present divided into two groups led by Drs. Mike Lyons and Frank Sharkey. Dr. Lyons made an appeal for more questions. Dr. Chuck Hitchcock asked if these questions had associated images. Dr. Lyons indicated that they did not have accompanying images.

C. Software and Technology Committee, Dr. Regina Kreisle, Co-Chair:

Dr. Kreisle asked members to make comments to her about the GRIPE CD's now. Dr. Chuck Hitchcock inquired about the file format of images. Dr. Kreisle indicated that she was looking into changing to JPEG images.

D. Photo Committee, Dr. John Holliman, Chair:

The Photo Committee evaluated 100 images at this meeting. Seventy-five were accepted.

The GRIPE photo contest was conducted. Two categories were considered, micro images and gross images. Three finalists in the micro image category had been chosen by the photo committee and were shown to the membership. Five finalists in the gross image category were shown.

The winners were as follows:

Gross Category

First Place	Mucinous carcinoma of the cecum; Jim Blank, PA
Second Place	Osteosarcoma of the femur; Submitted by Sandy Templeton, M.D.
Third Place	Adenocarcinoma of the cecum with obstruction of the appendix; Jim Blank, PA.

Miscellaneous Category

First Place	Keratoacanthoma; Robert Howell, DDS
Second Place (tie)	Sturge-Weber syndrome, Robert Howell, DDS
	Herpetic whitlow; Robert Howell, DDS

Future Meeting Sites:

A. Summer 2001

The Summer 2001 meeting will be held July 24-28, 2001 in Park City, Utah in conjunction with the APC/PRODS meeting. GRIPE Committees will meet on Tuesday, July 24th. The New Course Directors' Workshop will be held on Wednesday, July 25th. Dr. Bob Boorstein will be the course director. Dr. Peter Anderson of UAB will assist him.

B. Winter 2002

The Winter 2002 meeting will be held January 16-19, 2002 in Tampa, Florida and will be hosted by the University of South Florida and Drs. John Balis and Santo Nicosia. Dr. Nicosia reported that the hotel would probably be an Embassy Suites near the campus and close to Busch Gardens. A very good restaurant, the Columbia Restaurant, is nearby and features flaminco dancing. Dr. Balis indicated that USF is indeed moving to an integrated curriculum. The meeting will report on "growing pains" of integration.

C. Summer 2002

The Summer 2002 meeting will be held in Oklahoma City, Oklahoma and will be hosted by the University of Oklahoma Health Sciences Center.

D. Winter 2003

A site has not been selected. Interested departments should contact the Central Office.

E. Summer 2003

The Summer 2003 meeting will be held in London, Ontario. Dr. Bertha Garcia gave a brief presentation on London. London is located 113 miles from Detroit, Michigan and 117 miles from Toronto, Ontario. The Stratford Festival is 29 miles from London.

Old Business

There was no old business.

New Business

A. A motion was made that Bernard Klionsky be moved to emeritus member status. This motion was approved.

B. Dr. Kreisle mentioned that the GRIPE website needs to be updated. She is planning to do a survey at Park City.

C. Dr. Holliman announced that if anyone needs something to be distributed to the membership by email, send the message to him at the Central Office.

D. Dr. Sebastian Alston stated that strategic planning is needed for GRIPE. This was discussed at the Executive Committee and will be addressed in Park City.

E. Dr. Klionsky congratulated Dr. Holliman and Ms. Deborah Redwine of the Central Office. He urged sending letters to institutional members which ask for referrals. He emphasized that personal contact is recommended.

F. Dr. Bob Lee discussed his plans for presenting the history of GRIPE. He suggested that a videotape be made that will be shown at Park City. He mentioned the start of GRIPE by Dr. Tom Kent and 13 others primarily from the Midwest. Dr. Lee indicated that he would like information about and photographs of members with comments about GRIPE and its role. “What is GRIPE great for?” He will write to the members with his requests.

Additional Discussion

A. Dr. Bertha Garcia asked if GRIPE member status could be indicated on the badges at Park City. The APC will be consulted.

B. Dr. Bernie Klionsky stated that increasing membership might lead to lower dues for the entire membership.

C. A discussion about the benefits of GRIPE followed. Dr. Garcia detailed the struggle to maintain membership. Dr. Frank Sharkey asked about the amount of money that creating a test question would require.

D. Dr. Holliman thanked Dr. Bhusnurmath for hosting this meeting. He presented Dr. Bhusnurmath a shirt with GRIPER.org in appreciation. Dr. Sharkey inquired if more shirts with GRIPER.org could be made by the summer meeting.

Adjournment

The meeting was adjourned at 12:46 p.m.

Respectfully submitted,

Sebastian R. Alston, M.D.

FUTURE GRIPE MEETINGS

WINTER 2002

Tampa, Florida

January 16 (committees) 17-19, 2002

Hosted and sponsored by
University of South Florida College of Medicine
Department of Pathology
Santo V. Nicosia, M.D.
John Balis, M.D.

SUMMER 2002

Oklahoma City, Oklahoma

June 19 (committees) 20-22, 2002

Hosted and sponsored by
University of Oklahoma Health Sciences Center
Department of Pathology
John H. Holliman, M.D.

University of Oklahoma Health Sciences Center / Department of Pathology / BMSB 434
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JUNE 20-24, 2000 Meeting

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January 10-13, 2001 Meeting

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Institutional Members
January 1, 2001

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