Genetics in Jeopardy: The Diagnosis and Treatment of Chronic Disease in an Undergraduate Medical Course—A Case Report

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Presenting Symptoms

The course in medical genetics at our University consists of thirty lectures and four laboratory sessions given to two hundred and fifty medical students at the beginning of their second year in which they begin their clinical studies and can purge, with a sigh of relief, the large dose of basic science administered to them in their first year.

This course had been in trouble for a long time. Among all courses in the second year curriculum, it had, for many years, consistently received the lowest rating from the students. Representations by the medical students to our medical education division on any subject whatsoever would more often than not end in the request: "Oh, and by the way, can't you do something about Medical Genetics?" The coordinator of the course, an internationally respected authority in the field, discouraged by the uncomplimentary ratings, finally threw in the towel and requested that somebody else run the course.

The new coordinator (RJMG), on being appointed, consulted a member of the Division of Studies in Medical Education (RGT) to determine what treatment his specialty had to offer. It was decided that the first step was to take a history and interview all the people who were involved in the course. These discussions brought to light the following attitudes and opinions:

Case History

The medical students confirmed the long standing reputation of the course. They saw it as largely irrelevant to the practice of medicine. The only clear idea they expressed about the goals of the course was that it seemed to provide a mechanism for rewarding outstanding researchers with an opportunity for a self indulgent exposition of their area of expertise. The students' perception of the lectures as solo virtuoso performances, unrelated to any central theme, was confirmed, in their mind, by the fact that a lecturer would sometimes deal with a topic which, unknown to him, had previously been addressed by another lecturer. Finally they perceived the examinations as devious attempts to catch them out, requiring them to understand or recall detail which had not been included or, at best, adumbrated in the lectures. They perceived the lecturers as arrogant and unsolicitous.

The demonstrators in the course also provided a rich variety of insights. There were twelve of these, all of whom were doctoral students carrying on fundamental research in molecular genetics and cell biology. In a frank and lively meeting at which they and the authors were all present, they expressed the view that the medical profession purveys a relatively modest body of superficial knowledge at inflated prices. In the medical students, they discerned this defect in embryo. As they saw it, the material which the medical students were required to master was almost childishly elementary, and, in spite of this, the medical students were continually pressing to have the material presented in an easier and more assimilable form requiring minimum digestion before regurgitation at the exam. The graduate students were interested in knowledge for its own sake and were uncomfortable with those who were not. On the other hand, they revealed that they did not feel at home with clinical concepts, and one demonstrator confessed that he had avoided a difficult clinical question, which he did not have the experience to answer, by emitting a smokescreen of complex numerical calculations. The demonstrators (who were, themselves, unclear about the goals of the course) had developed a cynical defensiveness in response to the consistently inhospitable attitude of the students.

The faculty lecturers, in most cases, did not realize how unhappy the medical students were with the course. Their

contact with the students was brief and desultory, typically confined to the delivery of a few lectures to a class of two hundred and fifty students. On being told that the students were unhappy, they took the view that not much could be done about it since the cause of their unhappiness with the course seemed to be its content which had been distilled over the years into an ineluctible residue of essential knowledge.

The previous coordinator took a traditional view. She felt that the medical students were indulged to an absurd extent and that they should simply concentrate on learning what they were expected to learn since they did not have the experience to make reliable judgments about what was and was not relevant. She did not feel that the intervention of a medical educator, innocent of genetics, would prove useful or relevant.

The new coordinator took a rather different view based, in part, on inquiries he had made at other medical schools which had revealed two interesting facts. First, the content of Medical Genetics courses in other universities was remarkably similar to the content of our course. Second, all the courses in Medical Genetics given by other universities seemed to be received with a lack of hospitality similar to that displayed by our own students. Having reflected on this information and on the experience he had had teaching medical genetics in this and another university, he came to the conclusion that the teaching of medical genetics was beset by problems inherent in the discipline itself. However, having consulted an educational "therapist," he was willing to listen to the clinical advice offered.

Diagnosis

These discussions had revealed to the medical educator a very clear picture of the pathology of the course. There was no clear policy about what the course was intended to achieve. While the general goal was obviously to teach the students medical genetics, the meaning and relevance of this discipline to the students had not been worked out in sufficient detail. There was no clear plan, and what plan there was had not been clearly communicated either to the teachers, the demonstrators or the students. In fact, the various participants in the course had quite different ideas about its goals. As a result of all these circumstances, the students had no confidence that the course was of any value.

Plan of Treatment

Clear goals were formulated. It was decided that the goal of the course would be to teach "What the Primary Care Physician Needs to Know about Genetics." This was broken down into subsidiary themes "The Mechanisms of Genetic Disease" and "The Management of Genetic Disease." It was to be explained that the mechanism of disease is crucial to devising rational treatment. (This is not entirely true since there are some diseases which we understand completely and are unable to treat and others of which we are completely ignorant for which we can offer some help. However to the extent that the concept is true, it is of heuristic value.)

The management was broken down again into assessment of risk ("Will it happen again, doctor?"), treatment, and counseling. Each lecture in the course was related to one of its central themes. For example, in teaching mechanisms of heredity, it was explained that this knowledge was necessary in order to instruct the parents what they might expect for future children. The management was further classified into that which could be undertaken by the primary physician and that which should be delegated to specialists. It was explained, however, that the primary care physician must have an understanding of those problems normally handled by specialists so that he could both understand and assess what the specialist was telling him about and doing for the patient.

The goals were explained. They were explained to the students in an introductory lecture much as summarised above. In addition, throughout the course, whenever a new lecturer appeared on the scene, the coordinator introduced him and, after issuing suitable testimonials to the lecturer's expertise and prominence in the field about to be expounded, he reminded the students how it would fit into the plan of the course.

The goals were explained to the lecturers. At a meeting, the lecturers were reminded what the plan of the course was. In fact, they had all been consulted during its formulation. They were then reminded about the purpose of their particular lecture within the general plan. It was pointed out which of the lectures prior to their own would develop material on which the content of their own lectures would depend and which subsequent lectures would, in turn, build on their own material.

It was suggested to them that they make reference to those lectures. While at least some of the lecturers regarded all this as a trivial and nugatory exercise, they genially agreed to go along with it, probably to humour the coordinator.

The goals were explained to the demonstrators. The insights which they had acquired in the course of our preliminary discussions were reinforced. They were reminded that scholars and scientists have an attitude toward the acquisition of knowledge very different from that entertained by people who are acquiring knowledge so that they can apply it. It was pointed out that these differences are rational and legitimate. The student who aspired to become a physician would find few clinical problems whose treatment required the mastery of genetic material. Moreover, although the mastery of genetic mechanisms can provide students with a powerful theoretical framework into which can be fitted the mechanisms of many diseases, this perspective is not immediately obvious to the medical student. It was explained to the demonstrators that whereas the course was extremely easy when measured in their own terms as scientists, the students had other kinds of difficulty to face: the acquisition of a large amount of new material and the struggle to synthesise it and assess its relevance to their ultimate goal of practising medicine. They were reminded of their own difficulties in grappling with clinical problems.

The graduate teaching assistants agreed to:

1. adopt an attitude of helpfulness, understanding and support toward the medical students;
2. take seriously and attempt to answer the students' questions and, if unable to do so, seek help from a clinical instructor;
3. welcome the students' criticisms of the course and bring them to the attention of the coordinator.

Under New Management. The medical educator advocated some marketing of the new product prior to its delivery so that the students' acceptance of it would not be prejudiced by expectations based on what they had heard about the old product. It was widely advertised that the course was under new management and that the goals and organization of the course had been radically revised. A high profile was given to the new coordinator who was warned by the medical educator that, by virtue of this manufactured celebrity, he would be

held to account if the course, when delivered, did not meet the specifications promised in the advertisements.

Initial Response to Treatment

The mood of the class appeared to be dramatically better than in previous years. At first, whenever the medical educator discussed the course with students, either individually or in small groups, they unanimously expressed their surprise that the course was so much better than they had expected from its reputation. Moreover, the new coordinator was delighted with the absence of the "legalistic" attitude of the students which had so discouraged the previous coordinator. He had not been bombarded by persistent attempts to discover the nature of the exam questions and the precise page numbers of text for which students were to be held responsible. No systematic effort was made at this point to measure student attitudes, but the positive attitude toward the course was obvious to the medical educator who was in frequent contact with both the students and the teaching assistants.

Of course, the positive climate might have resulted from characteristics inherent in the class rather than from our efforts. However, a dramatic event convinced us that this was not the case.

Relapse

Half way through the course, a crisis occurred. It was precipitated by a mid-term test. Our policy about tests, which had been clearly stated, was that success in them would depend on the mastery of broad and relevant principles and not on the memorization of trivial detail. The question which precipitated the crisis, although conceived with the promised purpose of revealing a principle, had been inadvertently designed in such a manner, that its solution did, in fact, require knowledge of a particularity which the students thought trivial. The students perceived this as a breach of promise, which recalled to their minds many similar incidents throughout high school and university, when tests had failed to reflect the espoused objectives of the course. They panicked.

Their reflexes jerked them into their old exam oriented strategy. Rather than attempting a conceptual mastery of the

material, they sought, by skillful interrogation of the course coordinator, to divine the contents of the final exam. They pestered him to specify exactly what, or failing that which page, in the readings they were responsible for.

Under this assault, signs of deterioration began to be observed in the coordinator. In his view the course plan was reasonable and humane. The issue had been simply a slip made by one of the section teachers who had not fully realized the implications of her question. He had told the students that the final exam would require an understanding of the ideas and concepts in the readings. Why did they not believe him? The course coordinator, beginning with the best intentions, was beginning to share the view previously held by the teaching assistants—that the students were pragmatic, exam-oriented and without real interest in the mastery of the material. He resisted their entreaties for specific information about the exam, and this, in turn, increased the students' suspicion about his real intentions.

The reason for the students' reaction was quite simply that the students had nothing in their past to warrant the trust that the coordinator expected of them. They had been burned before. They had learned that the educational goals of the instructors were reflected much more accurately in exams than in the instructor's abstract statements of intent. They believed the lab exam and not the espoused aims of the course. Morale plummeted. The honeymoon was over. Some cynics were quick to point out that the climate is always good until the students have to pay the piper. No one likes exams. The medical educator did not accept this cynical view. He recognized these events as the downward spiral of mistrust. The general feeling among the students, gleaned from hallway conversations, was that the course was not really a new deal, but just a sugar-coated version of the old pill. The genuine attempt to give the students a new deal had been threatened by a single slip.

Emergency Treatment

Something had to be done quickly. Each of the two factions had to understand that the other was sincere. The medical educator invited several students, a teaching assistant and the course coordinator to an extended luncheon. Over a bottle

of respectable Chablis, they talked. The students believed the coordinator's explanation of the error in the exam question but were skeptical about his ability to convince two hundred fifty other students unless he took them all to lunch, three at a time. The coordinator came to appreciate how exquisitely finely tuned the students' study habits were and how difficult it would be to convince the students to take the risk of abandoning them.

The strategy finally agreed on was that he should neither back down from his conception of a course directed to the solution of problems and the understanding of ideas nor give in to demands for a detailed menu of facts to be learned. Spoonfeeding would only have reinforced a bad habit.

On the other hand, it was clear that trust had to be rebuilt. We agreed on a rather formal explanation— an apology—which would be delivered at the beginning of the lecture on the following morning by the course coordinator himself. The explanation would be followed by a handout containing sample questions of the sort that would and would not be used. Finally, it was agreed that the exam itself would have to be carefully designed to reflect accurately the intent of the course.

The apology was a smashing success. The coordinator received a standing ovation. The change in climate among the students was palpable. The apology was salient in the minds of all the students we spoke to. The expectation about the exam was tinged with cautious skepticism, but the general mood of the class was cheerful and positive. Moreover, this was not a transitory change. The following year, a student told the medical educator, in the course of casual conversation, that one of his friends had experienced an historic event last year. For the first time in the history of the medical school, a teacher made an apology to the class for a mistake in the programme!

Final Assessment

After the end of the course three groups of six students were drawn randomly from the class and asked to comment on the course. The opinions expressed in these group discussions are summarized below:

1. *The Exam.* "The test was fair;" "Not too much picky detail;" "It required a grasp of the subject matter rather

than memorization;" "Of all the medical courses I have taken in medical school, this was the most sane."

2. *The Attitude Toward the Teaching Assistants.* "Their attitudes were O.K.;" "Their attitudes were excellent."
3. *The Lecturers.* Attitudes toward the lecturers ranged from "so-so" to "excellent;" "We felt that the teachers were concerned with us and with our welfare."

The students were not without some criticisms of the course. They complained about having had to buy a new textbook while the old one had looked good enough, not having been given more experience in identifying syndromes, not having a course syllabus, unevenness in the grading of lab exams and the wet-blanket personality of certain teaching assistants. A few students commented that the concept of subsuming the course under major themes could, with advantage, have been taken further and that certain lecturers were not paying attention to the themes that did exist.

However, conspicuously absent from their complaints were expressions of suspicion, lack of trust, or bad feeling about the course. Whenever the interviewer attempted to elicit attitudes of this kind, he failed to find them. The value of the evidence provided by the students was limited by the fact that having experienced the course only for one year, they were unable to make direct comparisons with previous years. But most of the demonstrators had taught the year before, and their comments corroborated what we had inferred from the students' comments.

Typical Comments from Teaching Assistants: "I felt better this year [teaching] because students seemed to be enjoying it more;" "There was very little attacking of the course by the students."

They showed much more insight into the students' problems, recognizing how difficult it had been for them to make the important change in their style of study in response to the new requirements of the course. However, like the students, the teaching assistants also had criticisms, for example, the lack of a syllabus and the inconsistent standards of marking among themselves.

Four of the five lecturers who had taught in both years were also interviewed. Their comments confirmed our assumption that the main contact with the students was through

the teaching assistants. Most of them did not notice any difference in the students nor in their teaching. However, most lecturers, who had taught in the course before, received much higher ratings than they had previously enjoyed.

CONCLUSIONS

The attitudes expressed by the behaviour observed in both the students and the demonstrators left no doubt in our minds that the reforms which were instituted had caused dramatic improvement in the social climate. In one year, a course which had certainly been the most unpopular had become one of the most popular. The question is—why did this happen? In formal terms, very little had changed in the organization and content of the course. Roughly the same things had been taught, largely by the same people and in substantially the same order. We had done little more than put old wine into new bottles. It seems that the social atmosphere and repute of this course had been radically changed by reforms which, on the surface, appeared trivial, an impression confirmed by the dramatic impact of the coordinator's trivial confession.

The answer, we believe, is that the changes we instituted restored trust in a body of students whose inherent inclination is to be mistrustful of the system in which they are being educated. For the most part, medical students learn basic science not because they are interested in it but simply because they have been told they must learn it to achieve their real goal which is, of course, to become doctors. They believe, and they are in part correct, that the subjects which they are required to learn and the methods whereby their knowledge of these subjects will be tested, are almost arbitrarily chosen. This forces them into adversarial strategies to beat a system which does not make much sense to them. The extra effort made in our experiment to explain the relevance of the ideas being presented to them and to offer sensible methods of assimilating them went a long way, though not the whole way, towards removing this fear and distrust.

Of course, we have no means of knowing whether as a result of this they learned any more. But, there is evidence in the literature to suggest that they may have. It has been shown that an encouraging environment releases energy that students otherwise use to cope with an adversarial system, and that the

energy thus released is redirected into the task of learning. They listen better with fewer distortions and distractions. They have a greater appreciation of class content. They attend class more frequently, and they learn more.

Whether or not our students learned more genetics than their predecessors, they almost certainly left medical school with a kindlier disposition towards this subject which, in the long run, may have helped them better retain what they learned.