

Students' Experiences With Real-Patient Tutorials in a Problem-Based Curriculum

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Background: To bridge the gap between preclinical and clinical education that still exists in the problem-based medical school at Maastricht, tutorial groups in which clinicians guided and discussed students' interactions with real patients were introduced in the preclinical program.

Purpose: To find out what students find instructive in these patient tutorial groups and how this should be interpreted in relation to the problem-based character of the curriculum.

Methods: Two focus groups were composed of participants of the patient tutorial groups in 1996–1997. They discussed relevant issues in two sessions and approved reports of the outcomes.

Results and Conclusions: Students found the real-patient contact in the tutorials very valuable. They had not practiced taking a history to formulate and test a differential diagnosis with patients before. Problem-based tutorials with written cases were said to frequently lack depth of discussion. Individual contacts with simulated patients were found to be important in testing one's own knowledge and skills.

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The tradition in medical education is to provide students with a basis of knowledge in the biomedical and clinical sciences before they have hands-on experience with patients in a clinical setting. This division between preclinical and clinical education is known to have led many students to experience a gap between theoretical knowledge and the application of this knowledge in practice. Recommendations for improving medical education, therefore, emphasized the integration of basic science teaching and the training of clinical knowledge and skills.^{1,2} Because this is one of the major objectives of the instructional method of problem-based learning (PBL),^{3–5} many medical schools have considered adopting this educational format in some way or another. In a problem-based medical school, students acquire knowledge by working through (clinical) problems in a small group under the supervision of a tutor. In discussing a problem, students activate and elaborate on their knowledge to identify what they do not know to solve the problem and to explain its critical features. This results in learning issues that are pursued in self-study. In the next session, students discuss what they found in the literature and use this knowledge to come to a deep understanding of the problem and how it can be dealt with.^{3–6} The advantages claimed for students' learning

in a problem-based medical school are that students (a) acquire an integrated body of knowledge by studying basic science knowledge in the context of clinical problems, (b) will be able to apply this knowledge in clinical problem solving, (c) develop self-directed learning skills needed for lifelong learning as medical practitioners, and (d) will be more highly motivated learners.^{3–5,7,8} Because PBL is mostly implemented in the preclinical curriculum (i.e., a phase before the clerkship), it might be expected that PBL students would have fewer problems with the transition from theory to practice than their colleagues in conventional curricula.

Our experience in Maastricht, however, is that PBL students still have difficulty in applying the knowledge acquired in the preclinical years of their study to the patient problems they encounter in their clerkships. This was reported by both students and clinicians and has recently been confirmed by the results of a clinical reasoning study, studies on the knowledge of clinical skills, and a qualitative evaluation study.^{9–11} Therefore, in the preclinical program, a new educational format was introduced that aimed to improve the development of practically usable knowledge: patient tutorial groups (PTGs). These groups were scheduled in the last year before clinical clerkship training, that

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is, in the 4th year of the 6-year Maastricht undergraduate program. The groups started in academic year 1995–1996.

The Maastricht Preclinical Curriculum

The first 4 years of the Maastricht undergraduate curriculum are preclinical and problem based. Tutorial groups (TGs) of about 10 students and a tutor meet twice a week during a curricular unit. In Years 1 and 2, when the curriculum focuses on the normal functioning of the human body, the problems given to the TGs are descriptions of a set of phenomena in need of explanation.^{4,12} The patient cases that are sometimes used are always meant to stimulate discussion of normal physiology. An example of a problem in Year 2 is provided in Appendix A. In Years 3 and 4, when the curriculum focuses on abnormal functioning of the human body, most problems are patient cases. These cases are meant to prompt students' thinking and studying on differential diagnosis, supplementary diagnostics, patho-physiology, prognosis, therapy, and course of disease.^{13,14} About half of the cases are written descriptions of a patient's case history, physical examination, and laboratory results. In the other half of the cases, only a short introductory description of the patient is given, and students need to gather more information by questioning their tutor. An example of a problem in Year 4 is provided in Appendix B. Besides providing information in free-inquiry cases, the role of the tutor is to critically follow students' discussions, only intervening to stimulate students' thinking and cooperation.^{15,16} Most tutors are members of the multidisciplinary teams responsible for design of a curricular unit and have as such relevant domain expertise. In addition to the problem-based tutorials, lectures are given once to twice a week. Students can also participate in programs for training practical medical skills, communication skills, and professional attitudes.¹⁷ These skills are trained in a controlled and systematic manner that includes contacts with simulated patients in each curricular unit. Orientation on health care practices, such as ambulance services, emergency rooms, nursing homes, district nursing, family practices, and hospitals are organized in the 1st year. From the end of the 2nd year to the 4th year, students are "adopted" by a family practice that they visit on 8 days to familiarize themselves with patients and their lives, to gain insight into the epidemiology of the population, and to practice their skills.¹⁸ Some curricular units in the 3rd and 4th year offer patient contacts to a limited number of students. The PTGs in the 4th year build on the skills and knowledge students have acquired in the previous years.

Educational Format of PTGs

In PTGs, a group of students take a history with an ambulatory or hospitalized patient to formulate a differential diagnosis. A clinician guides this process and discusses with the students the patho-physiology underlying the problem after the patient has left. Like tutors in PBL, clinicians stimulate students' thinking processes by questioning rather than lecturing. For both the patient contact and the patho-physiological discussion, 45 min are planned. Each group sees patients from the disciplines of neurology (two patients), surgery (two patients), and internal medicine (three patients). Usually, clinicians ask patients with common or illustrative diseases to participate (e.g., Parkinson's disease, epilepsy, inflammatory bowel disease, diverticulitis, liver cirrhosis, hemophilia, and heart failure). The PTG meetings on surgery and internal medicine are followed by a relevant simulated-patient contact (SPC). For the discipline of psychiatry, a similar program with videotapes and simulated patients instead of real patients is organized. For practical reasons, the PTG meetings are not embedded within the themes of curricular units but are planned in such a way that students should have relevant prior knowledge of the patient problems presented. Subscription to PTGs is optional.

The aim of PTGs—to improve the integration of theoretical and practical knowledge—is dealt with in three aspects. First, students practice taking a history to formulate and test a set of relevant diagnostic hypotheses. To this end, clinicians have to show students how questions can differentiate between different patho-physiological processes and diseases. Second, students are forced to translate their textbook knowledge into the language of patients and vice versa. Third, students learn to relate their patho-physiological knowledge of disease to signs and symptoms of the patient as well as to the clinical concepts used in medical practice. Additional aims of the program are that students discover gaps in their knowledge that can guide self-study, that they realize what influence a disease has on the life of a patient, and that they become more motivated. The clinicians guiding PTGs receive training in which these aims are elucidated and in which the necessary tutor skills are practiced in a simulated PTG session. Students were introduced to the program in the opening lecture of the academic year.

A questionnaire evaluating PTGs in 1995–1996 has already shown that students find the meetings instructive.¹⁹ To gain better insight into what students find instructive in this new method and how this outcome should be interpreted in the context of the problem-based character of the Maastricht curriculum, we performed a qualitative study investigating students' experiences with PTGs in relation to the preclinical program.

Method

Focus Groups

Focus group research is a method of qualitative research in which a group of people is invited to exchange thoughts on a certain topic.^{20,21} It is widely used in marketing research and policy research. More recently the method has been used for educational research as well.^{22,23} Focus group research aims at inventoring opinions and experiences by means of group discussions. Because people interact in groups, their views on a topic will be more deeply analyzed and may even be refined or modified. This is a strength of the method compared with individual questionnaires and interviews.

Participants

Participants were recruited from the 13 PTGs of 4th-year medical students (10–11 students per group) in academic year 1996–1997. Two focus groups of seven and nine students represented nine of these groups. Students in each PTG were randomly selected and contacted by telephone. We asked them whether they were willing and able to participate. In 4 groups we did not find any students who could participate on the selected dates. Overall willingness to participate was 80%. Students were paid a small compensation for their participation.

Focus Group Questions

On the basis of the results of the questionnaire evaluating PTGs in 1995–1996,¹⁹ four starting questions were formulated to discuss the instructiveness of PTGs in relation to the rest of the curriculum. Each question was briefly introduced. The questions were:

1. Why do you find PTGs instructive?
2. What would you like to improve in PTGs?
3. How do you think the PTGs could best be positioned in the curriculum?
4. What do PTGs add to regular TGs?

Procedure

A three-step procedure was used in which the second step helped to gain a deeper understanding of students' experiences and the third step helped to optimize the reliability of the results. Each focus group met for two sessions of 1.5 hours in a teaching room of the medical school. In the first session, students were asked to give their opinions on the focus group ques-

tions. The second session was planned to check and clarify students' opinions: They were asked to reflect on a summary of the outcomes of the first session and to discuss more specific questions that arose during analysis of the data. Dr. van de Wiel guided the group discussions. Dr. Schaper acted as an assistant moderator, taking notes and critically following the discussion, asking for elucidations and elaborations whenever appropriate. Moderators and students were sitting around a table. Coffee, tea, and cookies were available. The sessions were videotaped and transcribed. Finally, a report representing a group's discussions was mailed to students for approval. The focus group reports were returned by 6 students from Focus Group 1 and 8 students from Focus Group 2. All students indicated that the report accurately represented the discussions.

Analysis

The transcripts of the first focus group sessions were analyzed by the moderator. In reading through a transcript, themes in the discussion were identified and marked. Themes often recurred during a discussion and were not necessarily confined to answering a particular question. Subsequently, the transcript was thematically reordered. This categorization was critically discussed with the assistant moderator and adjusted whenever necessary. In addition, further questions were formulated to clarify points of ongoing debate and the meaning of some utterances. A summary of this analysis guided the discussion in the second session. The transcripts of these discussions were used to complete and refine the summaries. Finally, on the basis of the summary and the transcripts, a report was written for each group that represented students' opinions on the issues discussed. These reports described students' opinions on each question in order of importance. The intensity of an opinion and the extent of support was indicated. Characteristic quotations were given as illustration.

Results

In discussing the pros and cons of PTGs, students spontaneously compared the way they dealt with patient problems in PTGs, SPCs, and regular TGs. To our surprise, many students expressed a feeling of dissatisfaction with the functioning of both the SPCs in the first 3 years and the regular TGs. Therefore, we summarize students' opinions on PTGs, as well as on SPCs and TGs. Quotations that most accurately depict the discussions are provided (the initial of the student and the focus group number are given in parentheses).

PTGs

Taking a history with a real patient was found to be the most instructive aspect of PTGs because it allowed students to practice how to structure their questions to diagnose a patient's problem. Students said that clinicians played an important role in guiding this process by asking why certain questions were asked and how the answers of the patients should be interpreted. Students further reported that through the interaction with real patients they learned how patients express their complaints and they practiced how to phrase questions so that they are understood by patients. Students concluded that in PTGs they not only learned to take a history but also to rate the value of taking a history in formulating and testing a differential diagnosis.

"In taking a history you were forced to think systematically, to think what you would ask, and I found it really good to elaborate that in the discussion afterwards." (S1)

"Why do you ask this question? What do you think you will achieve by it? You learned to get more out of history-taking than just making a diagnosis by going through the standard list of questions." (Jd1)

"In PTG you learn to use your knowledge differently." (H2)

"In PTG you learn the difference between the things you read in a book and how to proceed when a patient is sitting opposite you." (P2)

The discussion of the patho-physiology underlying the problem in the second half of PTG meetings was not perceived as equally instructive by all students. Some groups, in fact, did not even separately discuss the patho-physiological aspects. Students found these discussions instructive if patho-physiological knowledge was used to evaluate possible diagnoses by explaining the relationship between signs, symptoms, and disease.

"[A good question to discuss patho-physiology is:] 'Do patients bleed if they have ulcerative colitis or if they have Crohn's disease? And why?'" (Jt1)

Despite the introductions given, the aim of PTGs seemed to be unclear for many students and clinicians. Usually PTGs were conceived as an exercise in solving a diagnostic puzzle. Therefore, a meeting was often restricted to the discussion of a specific disease in one patient. Students thought that they would learn more about diseases if the symptomatology and patho-physiology of a patient's problem were more elaborately discussed in relation to the diseases in the differential diagnosis. The role of the clinician in PTG

was crucial. Clinicians, however, fulfilled the tutor role in very different ways. A good tutor was said to be enthusiastic and critical in guiding the group process. Students concluded that the aim of PTGs should be better explained to both students and clinicians. They also suggested that simple and prototypical patient problems that can be diagnosed in 5 min usually do not stimulate discussion. On the other hand, students recognized that they should have some prior knowledge about the problems. Some students indicated that it was difficult to structure taking a history groupwise, especially when students randomly asked questions. A few PTGs developed procedures in which students were assigned to ask a question to prevent this problem. This was also said to prevent students who immediately recognized the problem from dominating the group process. Some organizational problems were raised concerning the planning of rooms, patients, and clinicians needing attention.

"I can imagine that the discussion, after the patient has left, can be much longer if you do not only discuss the disease of the patient, but also the related topics." (B2)

"[For a meaningful discussion] you need a good tutor, since the group tends to take things for granted." (C2)

"Sometimes a tutor was too strict, so we did not even have the chance to make mistakes." (Bk1)

"We had a tutor that just let the conversation go without any intervention, but after the patient had left, he told us what we should have asked." (Jt1)

"A less prototypical case elicits a more meaningful discussion." (A2)

The patient contact in PTGs was highly valued. Students found it motivating to apply and test their knowledge by interacting with real patients. It showed them what they could expect in practicing their profession. Students also believed that they were better able to remember knowledge about diseases if they had a picture and a story of a patient in mind. Therefore, students advocated having real-patient contacts more regularly and earlier in the educational program. It was suggested to integrate a PTG meeting in each curricular unit in the 3rd and 4th years. This would guarantee that they have prior knowledge about the problem and formulate learning issues for individual study.

"It is nice, if you studied a certain disease in a curricular unit and you can recall a face and a story with it." (Jt1)

"PTG is a very popular program, everybody likes it, because it is a look into what you can expect in real practice." (D2)

"I have made learning issues for myself [in PTG], but you know, I did not plan to study for them, because we did not deal with those problems in the rest of the curricular unit." (Jd1)

Relationship of PTGs and SPCs

Most students reported that PTGs had a positive influence on the quality of the SPCs. They said that in the first 3 years of SPCs they had focused on the social skills of taking a history, whereas in PTGs they focused on the content of the interaction with the patient. In SPCs in the 4th year, students reported applying both their social skills and their knowledge to diagnose a patient's problem. They found this to be a good exercise because they had to do it all on their own without support of a group and tutor. They also found that, through the combination with PTGs, SPC became much more interesting than in earlier years. However, students noted that the teachers of SPC still focused their feedback almost exclusively on communication skills and hardly on the quality of the diagnostic process. Students further indicated that in the curriculum, more attention should be given to the way history taking is structured in different medical specialties.

"In PTG you are part of a group and you are supported by others if you don't know something, but in the simulated patient contacts you have to do it all by yourself." (P2)

"In a simulated patient contact you take a history of a patient to get a general picture, but in PTG you directly focus on the patient's complaint." (S1)

Comparisons of PTGs With Regular TGs

Students argued that they focused much more on the diagnostic process in PTGs than in regular TGs. An important reason given for this was that patients did not present themselves as typically as they are usually described in the cases of TG. Students also said that patients did not express themselves in the medical terms that are used in textbooks and are given as case information by the tutors. They further reported that tutors in TGs asked far fewer "why" questions while gathering information about the patient than clinicians in PTGs. Students agreed that discussion of the patho-physiology underlying a differential diagnosis was usually less elaborate in TGs than in PTGs.

"In PTG you think more often on the basis of a differential diagnosis, while in TG it often occurs like that last time when everybody had read the

case and a few immediately thought, DIABETES. So they asked very focused questions in that direction, and all the answers were positive. Only when you study later on do you find a differential diagnosis." (Bs1) (The case to which this student refers is provided in Appendix B.)

"I find the difference [between PTG and TG] large, because my experience is that everything being discussed in TG is in the books, while in PTG you learn to test your thoughts in everything you do." (F1)

Regular TGs

If a TG functions well (i.e., the group interactively discusses the case and the studied material), students find the meetings very instructive. However, a large number of students felt a general dissatisfaction with the functioning of TGs. They found that there is not enough group discussion. Some others recognized the problem but did not really mind. The key problem identified was that only a small number of students are active in a meeting. Students described the average TG meeting as follows. In discussing and building the case, some students usually immediately know the diagnosis. This diagnosis directly leads to learning issues. Most students use the same handbook for self-study, and in discussing the learning issues they read their notes using a fixed sequence: etiology, epidemiology, pathology, clinical manifestations, prognosis, and treatment. If nobody in the group has any further questions, the meeting is closed. The case is often not recapitulated in relation to the material studied. Students found that quite a few tutors are not very active in stimulating the group discussion.

"PBL is great, but there needs to be discussion, otherwise it is not really exchanging information, and remains limited to reading and that's it." (M2)

"I find it annoying if hardly anybody says anything, if only three people are talking and the rest just sit there, looking at their watches every ten minutes. Then you cannot get any discussion. That happens quite often." (S1)

"A short discussion is no problem if the case is clear. But, discussions are often short even if the case is complex, and that is a problem." (D2)

"It seems that everybody is bored by TG after four years." (Bk1)

"Anyway, PBL is way off in its objective to learn from each other." (Jt1)

Several suggestions were given to stimulate group discussion. Although students agreed that they are themselves responsible for group functioning, they

found that the tutor has an important task in realizing a meaningful discussion. They also found that the cases should be complex enough to invoke discussion. Students further indicated that evaluation of group functioning occurs marginally and should be enhanced. One group emphasized that most students study to pass the exam at the end of each curricular unit. These students suggested that they would learn to understand rather than to recognize if the "true/false/I do not know" questions in exams were complemented by open questions about patho-physiology. The other group proposed to discuss more explicitly the relations among diseases studied in a curricular unit. All students thought that their motivation would increase if patient contacts were integrated in a curricular unit.

"What I find most important is that everybody in a TG is really motivated. If that is the case there are usually no problems." (N2)

"I think it has to do with the assessment system, we learn to recognize. Most people read through a book, and then they think they understand, but I don't think anybody can give a really good explanation, we just don't have to know this for the unit exam." (Bk1)

Discussion

PTGs were introduced in the problem-based medical school at Maastricht to improve the integration of theoretical and practical knowledge and therefore to prepare students better for practicing medicine in their clerkships. Although we don't know whether students do actually develop a better integrated knowledge base in PTG, and whether PTG actually facilitates the transition from theory to practice, we do know that students find PTG instructive.¹⁹ We wondered what students learn in PTGs and what they apparently miss in the preclinical curriculum.

The focus group study showed that students found PTG highly valuable because they could practice applying their knowledge in taking a history with a real patient. This meant that PTG attained its goal of teaching students how to structure taking a history to formulate and test a set of relevant diagnostic hypotheses, as well as how to translate between patient language and medical terminology. Patient contact, moreover, stimulated students' motivation. However, regarding a fourth goal of PTGs, we found that in many PTG meetings the patho-physiology underlying a patient's problem was not as elaborately discussed as intended. Students did recognize though that PTGs have the potential to make relations between signs and symptoms, patho-physiological processes, and diseases explicit. Two additional goals of PTGs were usually not realized in the meetings. Communication with patients in

PTGs did not explicitly address the influence of disease on patients' lives but was fully focused on obtaining the relevant medical information. Second, students usually did not pursue learning issues in self-study but learned only from practice and discussions in a PTG meeting itself.

Regarding the preclinical program, the data revealed criticisms on the functioning of regular TGs. These problem-based tutorials often seem not so advantageous for students' learning as they are supposed to be.^{3-5,7,8} Students had not yet developed such an integrated body of knowledge that they could easily apply their knowledge in clinical problem solving in PTGs. They indicated that in TGs they are not used to reasoning from symptoms to disease but rather from disease to its manifestations. Neither are they used to considering a problem from a differential diagnostic point of view. Furthermore, they often merely report what they studied in the literature without really trying to explain the patient's problem and how it should be dealt with. This means that the opportunity to study basic science knowledge in the context of clinical cases is not fully used in TG. The students' learning, in addition, is not so much directed by the gaps in knowledge they discover in discussing a case as by the diagnosis of the case and the requirements set for the unit exam. Finally, after 4 years of PBL, TG meetings often do not motivate students to learn in the way they were intended. On the contrary, many students feel rather bored by TG and routinely deal with its procedures or sit out the meetings. Strikingly, students did not explicitly discern the case formats of written cases and free-inquiry cases that are both used in the 3rd and 4th years.

Another significant finding of the focus group study is the importance of individual exercises, in our case the SPCs, in a curriculum that is centered around problem solving in small groups. Besides cooperation between individual members, working in a group allows a few persons to dominate the problem-solving process so that others do not really have to think for themselves.

For the Maastricht medical school, the present study disclosed several weaknesses in the educational program that need attention. First, both PTGs and TGs could have more impact on students' learning if the aims of these programs were better fulfilled in the meetings. The main issue of concern here is how to stimulate group discussions. If groups do not exchange knowledge and explanations, this is a missed chance to learn because misunderstandings and gaps in knowledge often become apparent only while explaining things to others. Students suggested that group discussion could be enhanced by examining students more explicitly on their understanding of the subject matter, by active tutors who probe further clarifications, by not too prototypical cases that for TG are formulated in a

more true-to-life way, and by clearly instructing and recurrently reflecting on the goals of the educational program. Another issue that needs attention in the Maastricht curriculum is the introduction of real-patient contacts earlier and more regularly in the preclinical program. The question is in what format these patient contacts should be provided. Besides PTGs, students mentioned patient-based lectures and bedside teaching. A final issue concerns the teaching of the diagnostic process. It was only in the PTG meetings that students learned to apply techniques of taking a history to diagnose a clinical case. The free-inquiry cases in TGs, which are designed to practice clinical problem solving, were remarkably enough not really used to that end. Further studies are needed to find out what actually happens in TGs tackling such a problem. The SPCs in the 3rd and 4th years could be better exploited to train taking a history, by evaluating students not only on their communication skills but also on the diagnostic value of their actions.

For medical education in general, and problem-based schools in particular, the present study provided some lessons too. First, the study showed that real-patient contacts are very motivating for students. As documented in another study as well,²⁴ students experience interaction with patients as the real thing, as the goal they study for. This is not only because they come to know the world of patients but also because they have to put their knowledge into effective communication. Written cases, free-inquiry cases, and even simulated patients cannot quite give students this experience. Second, evidence has been provided that active interaction in TGs is necessary to make PBL rewarding for students and faculty. Factors influencing the level of interaction in a group include the patient problems chosen, the method of assessment, and the enthusiasm of students and tutor. Students are known to learn ultimately to pass their exams,^{7,25,26} whereas tutors are known to vary considerably in the way they guide the group's process.^{5,7,23} Communicating and socializing the goals of PBL in students and tutors, therefore, should be a continuous effort. A third lesson to be learned is the importance of individual exercises in addition to small-group work in problem-based schools. Testing their individual knowledge and skills is both challenging and confronting for students. Finally, it became very clear that medical educators should be alert to whether their program is implemented as it is intended. Routine is disastrous for any educational system and should be prevented by building in enough challenge for both students and teachers.

The focus group method seemed to be a valuable tool to get a balanced insight into the functioning of an educational program. Unlike the program evaluation questionnaires administered after each curricular unit, the focus group discussions showed the more general dissatisfaction of students with the curriculum. The

discrepancy in the outcomes of the two evaluation methods might (in part) be the result of a selection bias in the focus group study because only students who chose PTG in their training participated in the focus group discussions. However, after 4 years of training, these students represented many TGs and training situations. Further research is needed to clarify what role the focus group method should play in overall curriculum evaluation.

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Appendix A: Problem 5 From Block 3 "Locomotion," Year 2 (1997-1998)

Dyspnea or Apnea?

Situation 1

A group of youngsters try to swim as fast as possible under water. Harry can cross the pool twice (25-m length), and now Henk attempts to beat Harry's performance. To increase breath holding he inhales and exhales deeply for half a minute or so until he feels a little dizzy. Then he takes a last deep breath and dives. He crosses the pool twice and makes a turn for his third lap. Halfway through the third lap he swims to the surface. However, before he reaches the surface he suddenly stops swimming. Big air bubbles are seen in the water and Henk is going down. Arno immediately dives into the water and brings Henk to the side. Henk

is unconscious and has stopped breathing, and his pulse rate is regular (123 bpm). Arno starts mouth-to-mouth resuscitation. After about 1 min, Henk starts to breathe again and regains consciousness. His first question is: "What happened?" And immediately after that he says, "Oh, I know, did I break the record?"

Situation 2

A 67-year-old man with dyspnea and chronic respiratory insufficiency is sent by his family physician to the department of pulmonology. His arterial partial pressure of carbon dioxide is 8.6 kPa, his oxygen saturation is 70%, and his pH is 7.28. The resident in attendance immediately administers pure (100%) oxygen at a rate of 2 L/min. Both ventilation and dyspnea decrease. The patient becomes somnolent and disoriented. Therefore, another sample of arterial blood gases is taken: Oxygen saturation has decreased to 65%, partial pressure of carbon dioxide is 8.9 kPa, and pH is 7.18. The resident does not understand why the patient is less short of breath but clinically deteriorating. He decides to beep the consultant.

Tutor Instruction

These cases describe two situations in which respiratory control plays an important role. After completion of this task, students should be able to explain what happens and the clinical findings. The main learning goal concerns the control of respiration (peripheral and central chemoreceptors, respiratory centers and respiratory control, and binding of oxygen and carbon dioxide to hemoglobin). Specific information about the cases is provided for the tutor.

Appendix B: Problem 6, Block 4 "Fatigue and Weight Loss," Year 4 (1997-1998)

Case VI

A man aged 70 years visits his general practitioner because of fatigue. He has been feeling "different" than usual for quite some time. His weight has increased considerably over the past few years. This often bothers him.

A year ago he started to fall and stumble regularly. Moreover, his vision has deteriorated in the past year; he sees everything through a haze. Maybe he needs stronger glasses.

Tutor Instruction

Diagnosis: Diabetes Mellitus Type 2

The tutor instruction contains information about the patient's history, physical examination, and laboratory results so the tutor can act as the patient and as a data-

base for results of the physical examination and laboratory tests. The students, thus, can play the role of physician. Students should come to a differential diagnosis and discuss etiology, patho-physiology, complications, and treatment. Both noninsulin-dependent diabetes mellitus and the falling of the patient need to be spelled out. Further information on these topics is provided for the tutor.