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*Published in:*  
 Medical Education

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*Document Version*  
 Publisher's PDF, also known as Version of record

*Publication date:*  
 2003

[Link to publication in University of Groningen/UMCG research database](#)

### *Citation for published version (APA):*

Pols, J., Boendermaker, PM., & Muntinghe, H. (2003). Incidence of and sequels to medical problems discovered in medical students during study-related activities. *Medical Education*, 37(10), 889-894.

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# Incidence of and sequels to medical problems discovered in medical students during study-related activities

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**Purpose** Students often act as subjects during practical and clinical skills training sessions. This routine seems to be quite acceptable for them but may present side-effects. Disorders, sometimes of a serious nature, have been discovered in medical students during clinical skills training. Because the incidence of and sequels to medical problems discovered in medical students during study-related activities are unknown, we carried out an explorative study.

**Methods** An anonymous questionnaire was administered to 1132 students (85%) in our medical school.

**Results** A total of 740 students (65% response rate) returned the questionnaire. Of them 124 (16.8% of respondents) reported 139 incidents. The estimated incidence was 1.5% per year. In 63 cases (45%) the diagnosis of a consulted doctor was known. Pathology (e.g. a ventricular septal defect) was revealed in 30 students (21%), a normal physiological variation (e.g. a functional cardiac murmur) in 22 (16%) and no abnormality was found in 11 (8%). Most of the

incidents (65%) occurred during clinical skills training. The incidents were experienced negatively by 35% of the students.

**Conclusion** Based on these findings, we estimate the incidence of medical problems discovered in medical students during study-related activities to be 1.5%. This and the moral and legal implications emphasise that every medical school should realise the possibility of consequences. In our opinion, this realisation should result, minimally, in the development of a protocol for students and faculty that outlines procedures for handling such incidents. Information should also be provided explaining these possible side-effects of medical education.

**Keywords** education, medical, undergraduate/\*methods, \*patient simulation, physical examination/\*adverse effects/psychology, students, medical/psychology, adaptation psychological, medical history taking, questionnaires.

*Medical Education* 2003;37:889–894

## Introduction

Students often act as subjects during practical and clinical skills training sessions and this routine seems to be quite acceptable for them. Chang and Power reported that students generally are very comfortable with practising physical examinations on each other.<sup>1</sup> O'Neill and colleagues have shown that students value the opportunity to acquire basic skills through examining each other.<sup>2</sup> This experience of being examined

can contribute to the development of an empathic attitude towards patients.

Recently, Braunack-Mayer raised questions about the ethical acceptability of the practice of medical students acting as surrogate patients for each other.<sup>3</sup> She explores the issue from a bioethical point of view and argues that there are both ethical strengths and weaknesses associated with this practice. She also offers guidelines to promote free and informed consent if medical schools decide to allow students to act as surrogate patients.

There is at least 1 other aspect of students examining each other that merits attention: namely, the unexpected finding of medical problems in students. In our medical school practicals and/or clinical skills training are organised from Year 1 through Year 4 (in the Netherlands it takes 6 years of study to graduate as a doctor). During past years, disorders, sometimes of a serious nature, have been discovered in medical students during clinical skills training.<sup>4,5</sup> Nothing is known of the incidence of and the sequels to this aspect of

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### Key learning points

Students are often the subjects for practical and clinical skills training sessions.

There is a substantial incidence of medical problems discovered in medical students during these and other study-related activities.

A protocol for students and faculty, outlining procedures for handling such incidents, should be developed.

Information should be provided explaining these possible side-effects of medical education.

medical education. A search of Medline (1966–2002) revealed no references dealing with disorders and illnesses discovered during educational activities.

The coincidental finding of a medical problem during educational activities has potential negative consequences both for students and for medical schools. For individual students, these consequences may include the psychological impact of an unexpected finding and diagnostic work-up or problems related to future employability and insurance. Medical schools might be held legally responsible for any harm incidentally suffered by students who suddenly become patients as a result of their education.

Because of the lack of information on the extent of the problem and the way students manage these situations, we decided to conduct an explorative research project to answer the following questions:

- Which disorders and/or illnesses are discovered in medical students through their participation in educational activities?
- What is the incidence of such incidents?
- During which specific educational activities does this occur?
- Do students consult a doctor when a disorder or illness is suspected?
- Which diagnoses are made as a result?
- How do students experience these incidents?
- What do students expect from their medical school in relation to these situations?

### Method

To answer the research questions, both quantitative and qualitative data were gathered using a self-administered questionnaire. It was made clear in the

questionnaire's introduction that we were interested in all (suspected) somatic and/or psychological disorders or illnesses discovered during educational activities. This was further explained as:

- 1 all disorders and/or illnesses discovered during practicals, clinical skills training, etc.;
- 2 all disorders and/or illnesses about which students became concerned because of study activities (patient presentations, study tasks, home study, etc.) and for which they consulted a doctor (or other health professional) even if it was eventually concluded that the disorder was of no significance.

Our instruction to report only concerns that entailed a consultation with a health professional was made in an attempt to exclude short-term concerns that are normal for medical students.

The questionnaire was pilot tested on a sample of 20 fifth year students, and, based on the results, a final version of the questionnaire, consisting of 17 questions, was formulated (Table 1).

The final questionnaire was administered to 1132 students (85% of all students at our medical school) who sat the progress test in April 1999. This test samples the complete domain of knowledge that is

**Table 1** Questionnaire

- 1 In which study year are you?
- 2 What is your age?
- 3 Are you male or female?
- 4 Has a disorder or illness ever been discovered in you, or have you ever consulted a doctor (or other medical professional) about a concern which came up as a result of your study?
- 5 During which kind of learning experience did you discover that there was possibly something wrong? (practicals, study assignment, lecture, home study, try to be as specific as possible)
- 6 During which year of your study did this occur?
- 7 What kind of disorder or illness was it? (e.g. athlete's foot, heart murmur, abnormal lab finding, high blood pressure, depressed mood, a specific disease, etc.)
- 8 If something was discovered during a practical or a clinical skills training session, did you then consult a doctor for further investigation?
- 9 What was the eventual diagnosis?
- 10 Did this have any consequences on your study progress?
- 11 If yes, how was it affected?
- 12 If applicable: how did your teacher(s) react?
- 13 If applicable: how did your fellow students react?
- 14 How was your experience of these events?
- 15 Did you start avoiding educational activities as a result?
- 16 If yes, which ones?
- 17 Do you have suggestions, as a result of your experience, about how such issues should be dealt with?

considered pertinent to undergraduate medical education and almost all students in all classes sit this examination 4 times per year.

To obtain descriptive statistics on the answers to closed questions SPSS was used. The answers to 5 open questions (5, 7, 9, 14 and 17) were entered into Microsoft Access. A content analysis produced the presented categories.

## Results

### Numerical data

Of the 1132 students who sat the progress test, 740 (65%) returned a completed questionnaire. The average response rate for students in Years 1 through 5 was 69.8%; for students in Year 6 it was 33%. In 129 students (17.4% of respondents) there arose the suspicion of a disorder or illness (referred to as a 'disorder' for the remainder of this paper). Five of them reported findings that had previously been documented and these students were excluded from further analysis. Although it was not intended, 12 students reported concern without having consulted a doctor or other health professional. We decided to include these incidents as 'concern without consultation' (Table 2). A total of 124 students (16.8% of respondents) reported 139 incidents (some students reported multiple incidents). Based on this number the incidence of disorders discovered during educational activities can be calculated. Taking into account the fact that students in the final year(s) had had a longer period of 'exposure', the estimated incidence is 1.5% per year.

The incidents were classified into 3 groups (Table 2):

- 1 unexpected findings: disorders found by physical examination, laboratory tests, etc. (63%);

**Table 2** Classification of incidents and their outcome

	<i>n</i>	P	PV	ND	NC	?
Unexpected finding (63%)	<i>n</i> 88	19	20	5	36	8
	% 100	21	23	6	41	9
Concern (27%)	<i>n</i> 37	8	2	6	12	9
	% 100	22	5	16	33	24
Unknown (10%)	<i>n</i> 14	3	–	–	8	3
	% 100	21	–	–	58	21
Total	<i>n</i> 139	30	22	11	56	20
	% 100	21	16	8	41	14

P = pathology; PV = physiological variation; ND = no disorder; NC = no consultation; ? = unknown.

- 2 concern: worry about the presence of a disorder (27%), and
- 3 unknown: not possible to classify into either of the above categories (10%).

Not all the incidents prompted the students to consult a doctor (or other health professional). In 63 of 139 cases (45%), a doctor (or other health professional) was consulted and the results of these consultations were known. They were divided into 3 categories (Table 2), as follows:

- 1 pathology was revealed, such as an iron deficiency, ventricular septal defect (VSD), carpal tunnel syndrome, hypertension, dilatation of the left ventricle or torn cruciate ligaments (21%);
- 2 a normal physiological variation was found, such as a functional cardiac murmur, breast tissue in the armpit, an inverted nipple or a difference in leg length (16%), and
- 3 no abnormality was found (8%).

Thus, in 21% of the 'unexpected finding' and 'concern' categories, pathology was found.

Most of the incidents occurred during a practical or clinical skills session (91 times; 65%), lecture (15 times; 11%) and study activities without direct faculty involvement (e.g. home study) (26 times; 19%). Five incidents occurred (4%) during the remaining types of medical training (such as clerkships). The type of training was not known for 2 of the incidents (1%). The cardiovascular system (25%) and the musculoskeletal system (22%) were most frequently involved in the incidents that occurred during clinical skills training. Home study and lectures most often led to a suspicion of a psychological disorder (15%) or a skin disorder (12%).

### Student experience

#### *Examples of incidents reported by students*

During the skills period 'auscultation of the heart', student M was examined by a fellow student, who, besides hearing the normal heart tones, also heard a murmur. The teacher was asked for advice. He confirmed the presence of a systolic murmur. M was referred to her family doctor, who referred her to a cardiologist. He diagnosed a small VSD.

During the skills period 'blood', students examined their own blood. Anaemia was seen in student N's blood and hypercholesterolemia was seen in student O's blood. Both students were advised to consult their family doctors.

During a study assignment about depression, student P encountered an inventory listing depression

characteristics and discovered that he fulfilled most of the criteria. He decided not to consult his family doctor.

During the skills period 'examination of the knee', a student suspected instability of student Q's knee joint. The student asked the teacher to repeat the examination and the tutor confirmed the finding. He proceeded to allow all the other students to examine the knee to demonstrate how instability 'feels'. Then he arranged for Q to have a consultation with an orthopaedic surgeon who was a friend of his.

A total of 88 (63%) students reported how they experienced the incident. Qualitatively their experiences can be described as positive, neutral or negative, according to their perception. For each of these categories we give an example.

#### *Positive experience*

'I found it a positive experience. Because of my education, my attention was called to something which then allowed me to take action.'

#### *Neutral experience*

'I was a little surprised that I performed less well on a bicycle home trainer than normal (I was below average, and the final trial was not done). I wonder what my family physician will have to say.'

#### *Negative experience*

'Indeed, I worried about that heart murmur.'

Table 3 provides an overview of the students' perception of the incident and whether or not they consulted a doctor. In each group, about twice as many students experienced the incident negatively as positively. Of the students who consulted a doctor, 42% found the experience negative, whereas 28% of the

students who did not consult a doctor found the experience negative. Further analysis of the data shows a difference in experience depending on which system is involved. Of the 21 students whose incident concerned the musculoskeletal system, 3 reported the experience as negative. Of the 19 students whose incident involved the cardiovascular system, 9 experienced it as negative.

#### **Student recommendations**

A total of 105 students responded to a question asking how the student thought that such incidents should be dealt with. Of these students, 48 had experienced an incident themselves and 57 had not. Their suggestions may be generally divided into 3 categories:

- 1 providing relevant information to the students;
- 2 treating each situation seriously and respectfully, and
- 3 establishing a protocol.

Further analysis revealed no significant difference between the suggestions made by students who had and had not personally experienced an incident. Therefore, they will henceforth be regarded as a single group.

Many students recommended that attention be given to this topic, preferably early in their medical education, in study guides or in other written informational material, during lectures, and at the beginning of clinical skills sessions:

'...at the beginning of our education so that you know what to do when something like this occurs.'

In the second category the importance of treating such incidents seriously was emphasised. Discretion was regarded as important:

'...treating the incident seriously, clearly explaining what should and should not be done...'

'...not shouting the finding out for all the students to hear...'

'The teacher should not treat the incident as an intriguing case to study.'

Finally, it was often suggested that guidelines should be established with a specific protocol outlining how abnormal findings should be handled. Faculty should be informed about the application of the guidelines:

'...clear instructions for teachers covering how the situation should be handled.'

Besides the 2 aforementioned suggestions about taking the situation seriously and treating the student with respect, there were 3 different categories of

**Table 3** How incidents were perceived compared with whether or not the student consulted a doctor

	<i>n</i>		Experience		
			Positive	Neutral	Negative
Total	<i>n</i> 88	15	42	31	
	% 100	17	48	35	
Consulted doctor	<i>n</i> 48	9	19	20	
	% 100	19	39	42	
Did not consult doctor	<i>n</i> 40	6	23	11	
	% 100	15	57	28	

additional recommendations for the follow-up of the incident:

- 1 ensure that faculty advises students to see their own family doctor when some kind of disorder is discovered;
- 2 ensure that the student has access to a specialist immediately if necessary, and
- 3 appoint a representative for students who is available to the students for confidential consultation and for advice in the event of an unexpected finding.

## Discussion

The results of the present study confirm the impression that somatic and psychological disorders are discovered in medical students through their participation in educational activities: 139 such cases were reported in 740 students. The estimated incidence of these incidents was 1.5%. With a total of 1330 students in our medical school, there was an unexpected finding 19 times each year, and there was true pathology in 4 of these cases.

Students are often the subjects for their own practical and clinical skills training sessions. Therefore, it comes as no surprise that this is when two-thirds of all cases were discovered. The fact that the cardiovascular and musculoskeletal systems were most often implicated is logical, as these systems are emphasised in clinical skills training sessions. It is worth noting that conditions that were suspected as a result of lectures and home study were usually of a psychological nature, specifically concerning a suspicion of depression.

More than 40% of students in whom a disorder was suspected did not consult a doctor. This trend was not restricted to insignificant conditions. For example, fluid in the knee, high blood pressure associated with a positive family history, hypermobility of joints and a positive Trendelenburg sign were reported by this group of students. Other research has likewise shown that medical students do not consult a doctor even when this seems indicated.<sup>6,7</sup> In a study by Roberts *et al.*,<sup>6</sup> 57% of students reported that they did not consult a doctor even when an indication was present. Reasons for this were reported to be, among others, that they were 'too busy', that they 'thought it would go away on its own', because of the high cost involved and concerns about confidentiality. We did not explore this in our research.

The findings of the qualitative part of this study indicate that two-thirds of the students reported the experience as being positive or neutral. We were unable to conclude whether the unexpectedness of the incident had any effect on the student's perception of the

experience because we did not systematically ask the students whether or not symptomatology was present prior to the discovery of the condition.

The student recommendations indicated that students wished to receive information about these incidents so that they could anticipate any consequences. They also provided clear, although sometimes contradictory, recommendations about how their concerns should be dealt with. The suggestion that the student's own family doctor should be consulted as much as possible appeals to us. The central position occupied by the family doctor in the Dutch health care system makes this a logical approach. Moreover, it teaches future doctors that it is a natural step to consult their own family doctor about health problems. A student advocate, such as a study advisor or an appointed medical specialist, should not, in our opinion, usurp the role of the family doctor. With all the above considerations we must not forget that faculty members who experience a serious incident also require some form of coaching and support.

There are several weaknesses in our study design. All data were based on student self-reporting and there was no independent verification of the diagnosis by a health professional. Because some instructions were too complicated, the category 'concern without consultation' is probably under-reported. Nothing is known about the 35% of students who failed to respond and it is not clear why the response rate among Year 6 students was so low. In our medical school we have no registration of students who had to stop their studies due to medical problems, so they are not represented here. In conclusion, based on our data, we can only estimate the number of times that a disorder was unexpectedly found. Only a prospective registration database, involving faculty, students and study advisors, would provide a reliable representation of the origin and extent of unexpected medical findings in medical students.

Nevertheless the number of incidents, and especially their impact (emotional; leading to doctor consultation), point to a consideration of the moral and legal responsibilities of medical schools.

The moral responsibility of medical schools towards students may be compared to that which a doctor has for his/her patients. In both cases, the adage should be '*primum non nocere*'. Just as patients trust doctors and expect to be given effective and efficient treatment without any needless risks, students entrust themselves to medical school for a number of years to be trained as doctors with the same expectations. Students do not realise all the consequences of their choice of study, and they do not realise that their education may also have

'side-effects'. For some parts of their education, medical schools expect students to participate as subjects and they may reasonably expect to suffer no ill effects resulting from their participation. If there is a risk, then they may also expect to be fully informed and to have the freedom to choose an alternative form of learning. The issue, however, is ethically complex. Medical schools have other responsibilities (e.g. to society) and there are other issues of concern for students (e.g. respect for autonomy).

From a legal point of view, it is important for medical schools in the Netherlands to offer an educational alternative, when possible, to students for mandatory study components. For the students' roles in clinical skills sessions and practicals an alternative can be offered, by, for example, using standardised patients. In this case, students will have to be informed and alternative study methods should be offered to those students who do not wish to participate as subjects. The implementation of such a management policy is the only way that medical schools can ensure that they are not held legally responsible for any harm incidentally suffered by students who suddenly become patients as a result of their education.

The results of the present study and its moral and legal implications emphasise that every medical school should realise the possibility of consequences. In our opinion, this realisation should result, minimally, in the development of a protocol for students and faculty that outlines procedures for handling such incidents. Information should also be provided explaining these possible side-effects of medical education. The local legal environment and moral considerations will determine the definitive content of such a protocol.

### Contributors

JP developed the study protocols, conducted and co-ordinated the study, and participated in data

analysis, interpretation and writing of the paper. PMB and HM developed the study protocols and participated in data analysis, interpretation and writing of the paper.

### Funding

No external funding was obtained.

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Received 12 February 2002; editorial comments to authors 23 September 2002 and 18 March 2003; accepted for publication 16 May 2003

