ORIGINAL PAPER
PŮVODNÍ PRÁCE

Establishing an Interdisciplinary Compulsory Elective Subject 'Spine' in the Curriculum of the University Study Course of Human Medicine

Zavedení interdisciplinárního povinně volitelného předmětu "Páteř" v kurikulu univerzitního studia humánní medicíny

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ABSTRACT

PURPOSE OF THE STUDY

Back pain and pathologies of the spine are among the main reasons why people consult a doctor, both general practitioners and paediatricians, as well as, specifically, orthopaedists, surgeons, and neurosurgeons. This involvement of different faculties calls for a high degree of interdisciplinary co-operation. In order to mediate these aspects of spine-specific diagnostics, therapy, and research to students during their studies and to promote up-and-coming specialists, the compulsory elective subject 'Spine' was established.

MATERIAL AND METHODS

From the winter semester of 2013 to the winter semester of 2014, the compulsory elective subject 'Spine' was offered to interested students in the 7th semester of their studies of human medicine. The maximum number of participants per course was 16. Each course lasted four weeks. The subjects taught covered the fields of degeneration, deformities, and destruction in the specialist disciplines of orthopaedics, traumatology, neurosurgery, and rehabilitation medicine. In addition, orthopaedic technology and the local musculoskeletal and biomechanical research institute were integrated into the course. Various teaching methods were applied, including problem oriented learning, seminars, observation or consultation, and internship. At the end, the course was evaluated with regard to subjective learning success, knowledge gain, satisfaction, and interdisciplinarity. Participants were compared with all students of the semester employing an objectively structured clinical examination (OSCE).

RESULTS

Forty-eight students took part in the compulsory elective subject 'Spine'. The compulsory elective subject was given a positive rating in all fields. In the learning success control, all of the students had good to very good results. Students attending the elective subject performed significantly better in the objective structured clinical examination (OSCE) ($p \leq 0.001$).

The compulsory elective course continues to be offered in the curriculum with a slightly altered schedule.

CONCLUSIONS

In view of the high prevalence of patients with back pain and its associated importance in terms of healthcare policy and social relevance, our experience leads us to recommend the general integration of such a compulsory elective subject in the study of human medicine.

Key words: elective subject, spine, students, spinal disorders.

INTRODUCTION

The prevalence of musculoskeletal diseases is very high, and virtually all of us are affected at some time in our lives. Musculoskeletal clinical pictures tend to take a chronic course and have a considerable influence on both the quality of life and the fitness for work of those affected. Accordingly, they cause enormous socio-economic costs in industrialised countries (1, 4).

The patients are cared for by professionals in many different specialist disciplines, such as general practitioners, paediatricians, rheumatologists, orthopaedists, and traumatologists. At around ¼ of all presentations, musculoskeletal diseases constitute the most common group of diseases treated by general practitioners (corresponding to 92 million treated patients in the USA in 2004) (5, 14).

In contrast, musculoskeletal contents are markedly underrepresented in medical training. Corresponding enquiries at medical faculties have revealed, for example, a proportion of 2.26% in Canada and 6% of all teaching contents of medical studies in Germany (14, 15). This marked discrepancy has been recognised over the past few years and has led to the proclamation of the 'bone and joint decade' for the targeted promotion of up-and-coming specialists and targeted investigations of the quality of medical teaching (6, 8, 12, 18).

In addition, the precise composition of practical, case-based, and frontal teaching is very inconsistent, whereby precisely thematically restricted internships or case-based teaching are advantageous for learning success, regardless of the specialist qualification desired (14, 15). Based on these findings, various groups have developed targeted practice-oriented teaching forms, whereby a statistical difference was produced at a minimum course duration of two weeks and more (5, 7, 16, 17). Efforts are also being made in Germany to restructure medical studies according to the requirements (13, 15).

Within the musculoskeletal diseases, the discrepancy between prevalence and courses offered as well as between interdisciplinary requirements and actual interdisciplinarity of the teaching is particularly marked in the case of complaints and diseases of the spine. In everyday clinical routine, spinal diseases account for the largest share within the musculoskeletal speciality. On the other hand, they are treated by professionals in very different specialist disciplines, such as general practitioners, orthopaedists, traumatologists, surgeons, rehabilitation specialists, and neurosurgeons. A successful therapy is often possible only with interdisciplinary treatment concepts. This was the reason we established the interdisciplinary elective subject 'Spine'.

MATERIAL AND METHODS

The compulsory elective subject 'Spine' was integrated into the study course of human medicine at the Charité University Medicine in Berlin in the 7th semester of studies. At this time, the participants of the compulsory elective subject had completed the subjects orthopaedics, traumatology, and neurosurgery. In a four-week course with a rotation system, 16 students were enrolled per semester in the period from the winter semester of 2013 to the winter semester of 2014. The course comprised a total of 72 teaching units in three weeks. The rotation system contained the subjects orthopaedics, traumatology, neurosurgery, rehabilitation medicine, biomechanics/research, and orthopaedic technology. Regarding content, teaching was structured in the subject fields of degeneration, deformities, and destruction, with a varying share of distribution among the specialist disciplines (Fig. 1). Major topics of the teaching regarding degeneration were: disc degeneration, disc herniation, spinal stenosis, degenerative scoliosis. The deformity topics were: scoliosis, hyperkyphosis and spondylolisthesis whereas

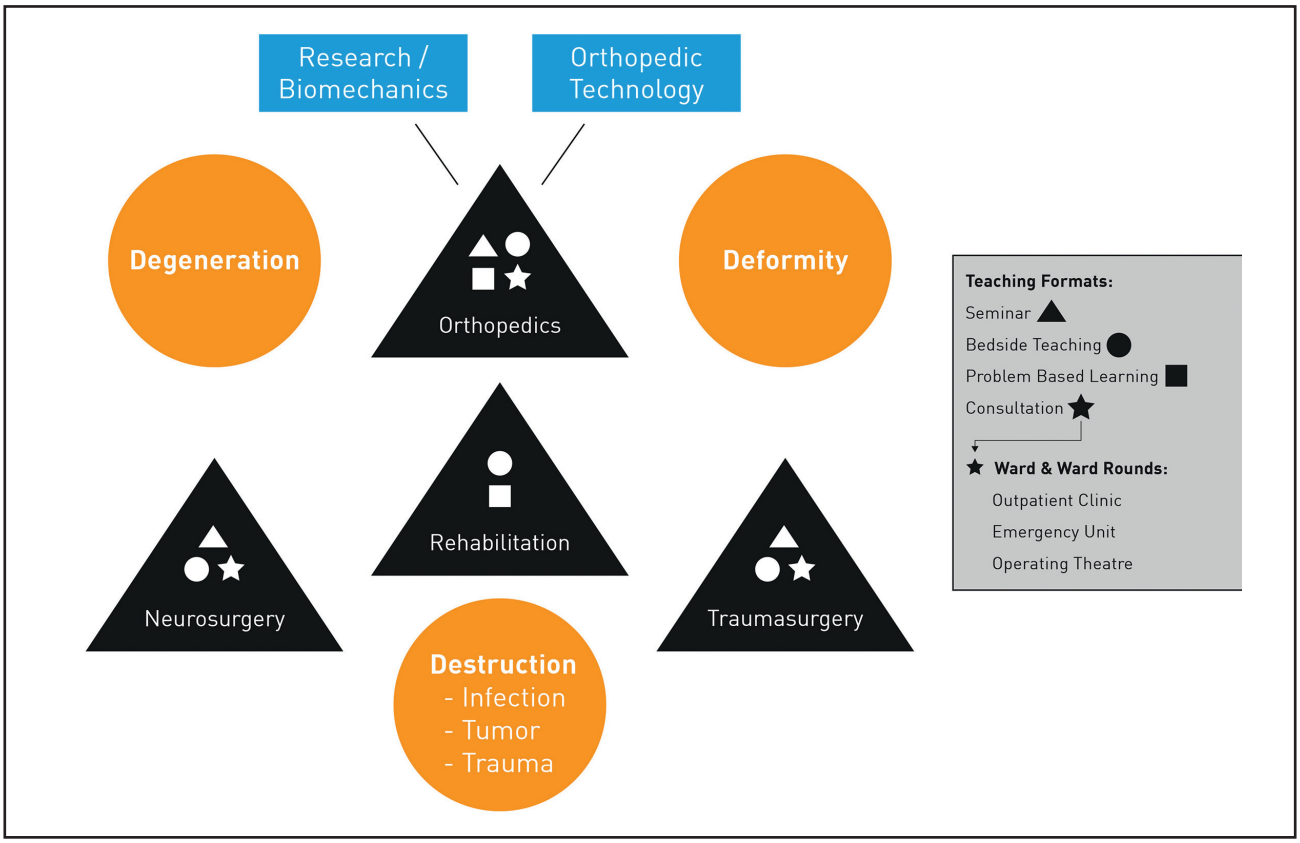


Fig. 1. Overview of the disciplines taught and the various stages and teaching methods; additionally, the orange boxes show the distribution of the teaching contents between the disciplines.

1. I liked particularly this area!

	Totally agree	Partially agree	Undecided	Partially disagree	Totally disagree
Degeneration and Deformity	+2	+1	0	-1	-2
Traumatology	+2	+1	0	-1	-2
Biomechanics	+2	+1	0	-1	-2
Neurosurgery	+2	+1	0	-1	-2
Rehabilitation	+2	+1	0	-1	-2

2. This section/this part provided a good insight into clinical routine and I liked it.

	Totally agree	Partially agree	Undecided	Partially disagree	Totally disagree
Ward and ward rounds	+2	+1	0	-1	-2
Accident and emergency unit	+2	+1	0	-1	-2
Operating theatre	+2	+1	0	-1	-2
Outpatient clinic	+2	+1	0	-1	-2
Orthopedic technology	+2	+1	0	-1	-2

3. General questions

	Totally agree	Partially agree	Undecided	Partially disagree	Totally disagree
Thecourse was interdisciplinary and diversifield	+2	+1	0	-1	-2
Problem-based learning was usefull	+2	+1	0	-1	-2
I gained hands-on experience	+2	+1	0	-1	-2
The contents were well structured	+2	+1	0	-1	-2
I would choose the course again	+2	+1	0	-1	-2

4. Questions regarding the topic 'spine'

	Totally agree	Partially agree	Undecided	Partially disagree	Totally disagree
My interest regarding this topic was increased	+2	+1	0	-1	-2
Learning targets and contents were teached in an understandable way	+2	+1	0	-1	-2
Surgical procedures were explained	+2	+1	0	-1	-2
I am able to carry out a specific examination	+2	+1	0	-1	-2
I had contact to patients	+2	+1	0	-1	-2

Comments, criticism and suggestions for improvement:

Fig. 2. Evaluation performed. Here, the students were able to rate and comment on the different areas. The age and sex of the students were also recorded here.

teaching regarding destruction consisted of infection, tumour and fracture. The teaching methods used included seminars, internships, bedside teaching, observation, and problem oriented learning. The observations took place within the faculties in the functional areas of the ward, operating theatre, emergency centre, or specific facilities of the respective faculty (e.g. gait analysis laboratory, rehabilitation centre) (Fig. 1). All teachers of the clinical subjects (orthopaedics, traumatology, neurosurgery, rehabilitation medicine) were medical doctors (physicians and senior physicians) working in spine units of the university hospital and were trained in at least one educational teaching course. Teachers of the research facility were engineers with specific educational training.

At the end of the elective subject in week 4, after independent consolidation of the material learned, the students took a written examination consisting of 20 questions and evaluated the course. The evaluation was structured into teaching methods, learning success, satisfaction, and interdisciplinarity. The different aspects were rated using a point system ranging from +2 (I agree completely) to -2 (I do not agree at all) (Fig. 2).

At the end of the semester for all students including those not attending the course, an objective structured clinical examination (OSCE) was conducted. The OSCE is an examination format in medicine that is designed to test the clinical competence of medical students. This examination format consists of a course of different stations, where practical skills such as the taking of a medical history or various methods of physical examination are examined. The examination principle was first presented in 1975 (11). In our study, the treatment of a patient with a herniated disc was simulated at one station.

Statistics

A nonparametric Wilcoxon matched-pairs test was used for statistical significance of the OSCE. A p-value of less than 0.05 was considered significant, and under 0.001 as highly significant. Statistical analysis was performed with IBM SPSS Statistics 21 software, and with Microsoft Office Excel 2009 for creating graphics.

RESULTS

Sixteen students took part in the elective subject per semester. After three semesters, 44 evaluation sheets could be analysed. Twenty-eight (63.6%) female and 16 (36.4%) male participants completed the course with good to very good results in the examination. None of the participants had to repeat the course. The age of the participants was between 20 and 33 years. (Figs 3–10).

Results of the OSCE

The students of the elective subject ‘Spine’ achieved a significantly better result in the OSCE than students of the semester who didn t attend. Mean number of students attending the OSCE per semester was 76. This included 16 students from the elective subject ‘Spine’. The average score of the students without attending the elective subject was 19.09 ± 3.18 (n = 180). The average score of the students attending the elective subject was 22.6 ± 1.14 (n = 48).

The results are shown in graph 1.

Figure 3

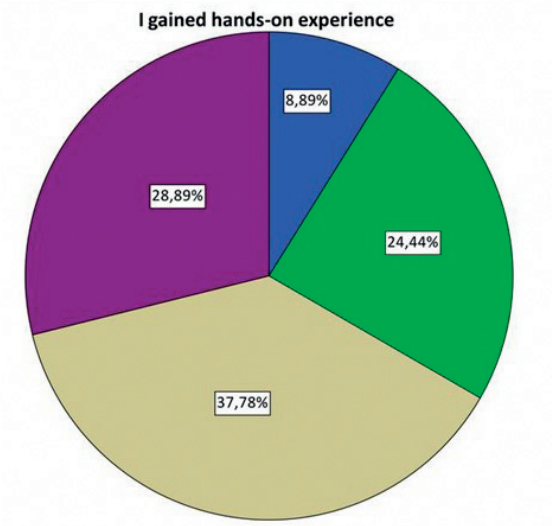
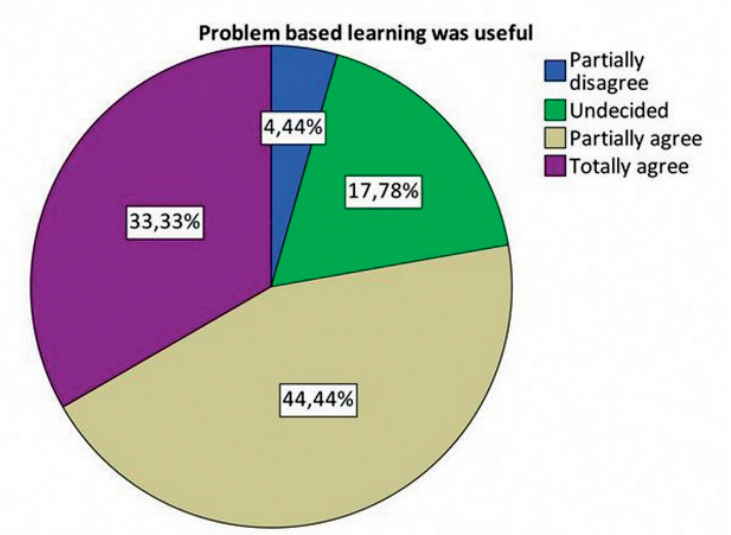


Figure 4



Figs 3 and 4. Evaluation of the teaching methods; 2/3 of the participants stated that practical work was possible during the compulsory elective subject (Fig. 3). Case-based learning was rated as positive by more than 3/4 of the students (Fig. 4).

Figure 5

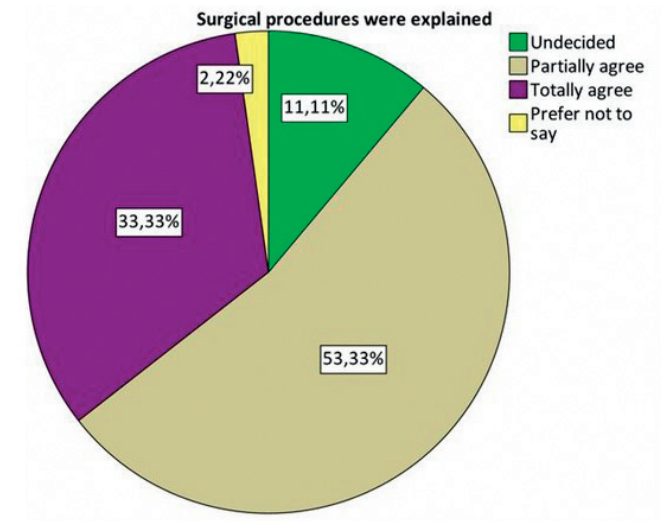
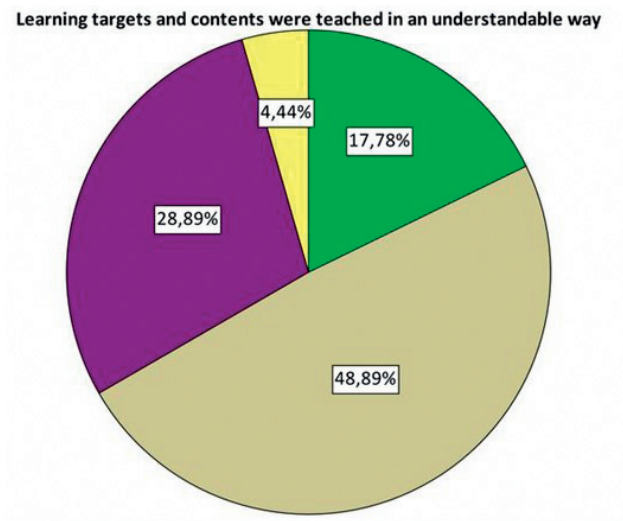


Figure 6



Figs 5 and 6. Evaluation of the learning success; 87% of the course participants stated that specific therapeutic procedures were explained during the elective subject. In the subjective perception of the students, 78% considered the learning target to have been achieved.

DISCUSSION

The results presented show the successful establishment of the interdisciplinary elective subject 'Spine' in the study course of human medicine. On the basis of the positive reception and results, the compulsory elective subject continues to be taught in the form described.

The elective subject that we established with modern teaching methods, with small and very small group-based learning, led to high subjective and objective learning success. The majority of the students were very satisfied with the additional course offered and particularly stressed the aspect of interdisciplinarity, which is crucial for the spinal field. The elective subject presented can function as a model for correcting deficits in the interdisciplinary requirements and qualitative deficits in teaching methods. Such deficits have indeed been the subject of various investigations, which have showed that the abilities of most doctors in relation to their knowledge of musculoskeletal diseases and examination methods are inadequate at the start of their careers (USA, United Kingdom, Ireland, Germany). Medical students in these studies were also aware of this problem and expressed their dissatisfaction with the interdisciplinary implementation and the methods used for teaching musculoskeletal contents within the context of their studies,

Figure 7

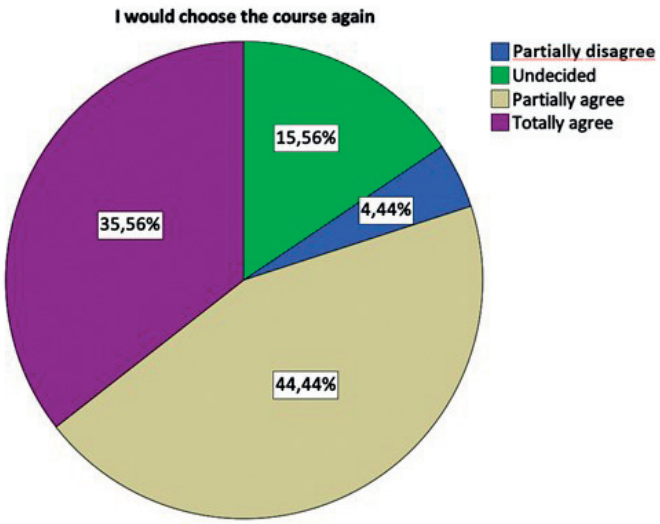
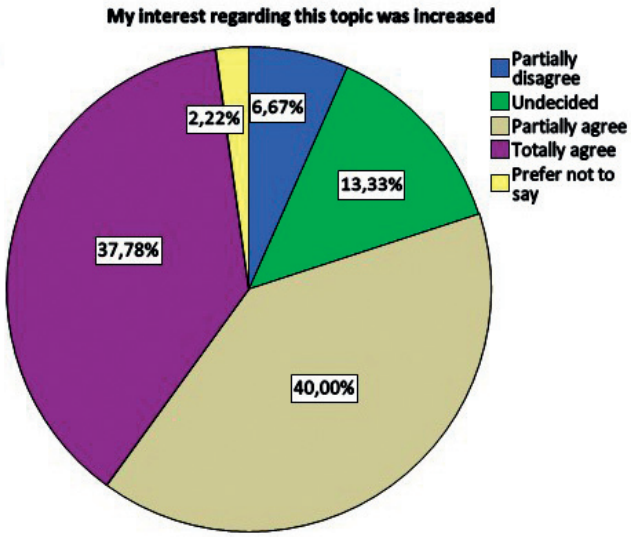


Figure 8



Figs 7 and 8. Evaluation of the satisfaction with the course also produced very positive results. 80% of the students stated that they would take the course again. Interest in the specialist field 'Spine' was increased in 78% of the participants.

Figure 9

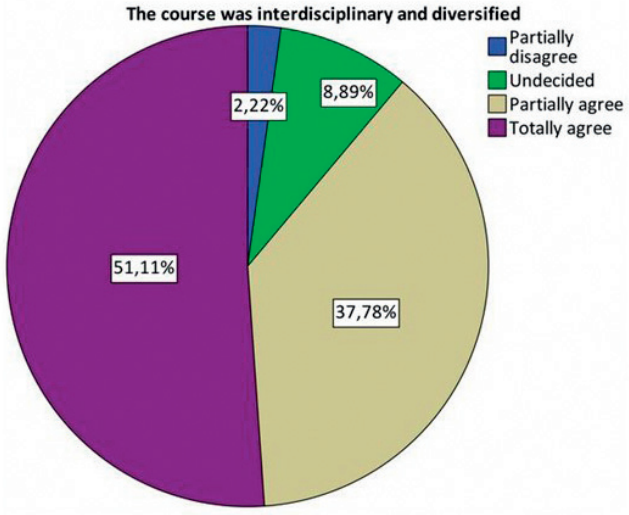
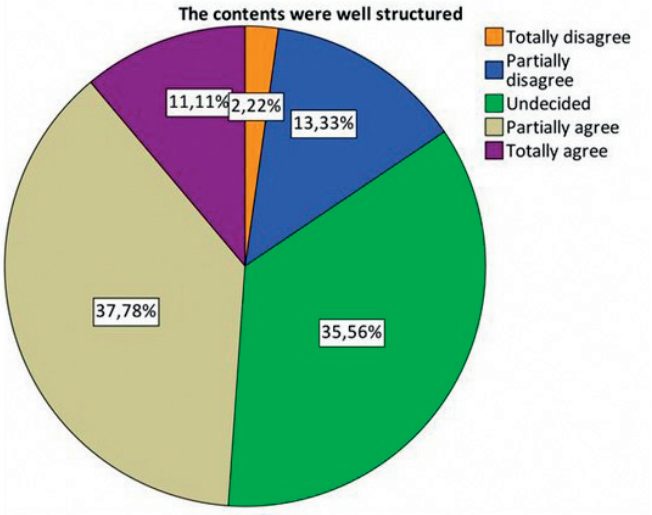
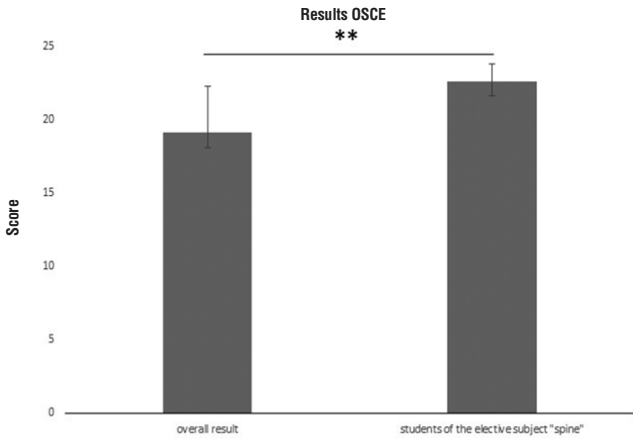


Figure 10



Figs 9 and 10. Evaluation of the interdisciplinarity; 89% of the participants stated that the elective subject had taken this criterion into account adequately. The structuring of the learning contents was rated as good by 49%.

Graph 1. The results of the OSCE. The students of the elective subject were able to achieve significantly better results ($p \leq 0.001$)



while recognising the great importance for everyday clinical routine (2, 3, 9, 10).

We implemented the practical and case-based forms of teaching already stressed in the publications of Pinney and Regan (2001) and Ruesseler et al. (2011) through a combination of POL, bedside teaching, and practical work (14, 15). The students were each assigned a 'mentor' for the period of the elective subject and taught in small groups. Specific topics from the subject 'Spine' were selected, on the basis of which the overall treatment from the first diagnosis to the final therapy was dealt with jointly. The four-week duration that we chose for the internship exceeds the minimum duration of two weeks recommended in the literature for a successful internship (5, 7, 16, 17).

The learning success was rated as positive by the students, and this result was objectively confirmed by the final examination. Furthermore, we were able to show that the students of the elective subject 'Spine' were able to achieve a significantly better result in the OSCE. A limitation is that this was a compulsory elective subject, and the participants were thus a selective student population that had consciously decided to take the course. Although this limits the conclusion according to which the subject 'Spine' would achieve similarly good results in all students, it had the advantage that particularly motivated students took part, for whom the course brought a correspondingly great increase in knowledge.

Overall, the evaluation showed a high level of satisfaction and adequate teaching methods. Eighty-seven percent of the students were satisfied with the explanation of specific therapeutic measures or treatments. Seventy-eight percent of the students reported that the learning targets were met. If one combines these statements with the positive results of the examinations, one can distinguish how successful this elective subject was in mediating a special subject like spinal surgery with interdisciplinary teaching and a high level of practical work adequately in a short period (5, 17). As a result of the under-representation of musculoskeletal contents in the overall study course of human medicine, this form of teaching provides a way of gaining students for a specific specialist discipline and promoting them at an early stage.

At the same time, this small group of students represents a limitation of this pilot project. There was no control group that, for example, took the test before the elective subject or took part without taking the teaching units. All participants chose the course of their own free will and were thus more motivated than if this subject had been compulsory. In addition, the course naturally represents a greater burden for the teaching staff, and the coordination and the premises have to be provided.

CONCLUSIONS

In conclusion, we have succeeded in integrating the interdisciplinary elective subject 'Spine' in the university study course of human medicine, which takes account of the clinical requirements, the modern concepts of student education, and the socio-economic relevance. We recommend the integration of such teaching courses into the standard university curriculum.

Conflict of interest
We did not receive any benefits directly or indirectly from commercial parties.

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