Medical Students' Clinical Skills Do Not Match Their Teachers' Expectations: Survey at Zagreb University School of Medicine, Croatia

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Aim To evaluate self-assessed level of clinical skills of graduating medical students at Zagreb University School of Medicine and compare them with clinical skill levels expected by their teachers and those defined by a criterion standard.

Method The study included all medical students (n = 252) graduating from the Zagreb University School of Medicine in the 2004-2005 academic year and faculty members (n = 129) involved in teaching clinical skills. The participants completed anonymous questionnaire listing 99 clinical skills divided into nine groups. Students were asked to assess their clinical skills on a 0-5 scale, and faculty members were asked to assess the minimum necessary level of clinical skills expected from graduating medical students, using the same 0-5 scale. We compared the assessment scores of faculty members with students' self-assessment scores. Participants were grouped according to their descriptive characteristics for further comparison.

Results The response rate was 91% for students and 70% for faculty members. Students' self-assessment scores in all nine groups of clinical skills ranged from 2.2 ± 0.8 to 3.8 ± 0.5 and were lower than those defined by the criterion standard (3.0-4.0) and those expected by teachers (from 3.1 ± 1.0 to 4.4 ± 0.5) (P<0.001 for all). Students who had additional clinical skills training had higher scores in all groups of skills, ranging from 2.6 ± 0.9 to 4.0 ± 0.5 (P<0.001 for all). Male students had higher scores than female students in emergency (P<0.001), neurology (P = 0.017), ear, nose, and throat (P = 0.002), urology (P = 0.003), and surgery skills (P = 0.002). Teachers' expectations did not vary according to their sex, academic position, or specialty.

Conclusion Students' self-assessed level of clinical skills was lower than that expected by their teachers. Education during clinical rotations is not focused on acquiring clinical skills, and additional clinical skills training has a positive influence on students' self-assessed level of clinical skills. There was no consensus among teachers on the required level of students' clinical skills.

Clinical skills and theoretical knowledge are two equally important parts of medical education (1). Lack of clinical skills is often a source of insecurity for physician and represents potential danger for the patient (2). Clinical skills in "traditionally oriented" medical schools are usually learned by watching what clinicians do, by interviewing and examining patients, and by presenting findings to a supervisor (3). Studies in teaching and learning in clinical settings found that clinical teaching is variable, unpredictable, immediate, and lacks continuity (4). Furthermore, faculty members do not always know what students do or how they actually perform, especially if assessment procedures are emphasizing assessment of cognitive skills (5,6).

Although this problem is well known, core clinical skills that need to be mastered during undergraduate education are still not clearly defined (7). One of the objectives of currently undergoing Bologna Process in medical schools is to define a system of accreditation, certification, or comparable procedures, including theoretical curriculum as well as clinical skills (8). Lately, the Delphi method has been applied to the curriculum design process (9). It is a flexible method, not subject to geographical constraints, which uses iterated questionnaires distributed to an expert panel to reach consensus on selected topic.

The aim of this study was to determine the level of self-assessed clinical skills of medical students graduating in the 2004-2005 academic year and compare them with the levels expected by their teachers and levels defined by the criterion standard proposed in the Delphi study (10). Factors that might be influencing students' learning of clinical skills and teachers' expectations were also analyzed.

Table 1. Basic descriptors of 229 final year medical students graduating from the Zagreb School of Medicine in 2005

Student characteristics	No. (%) of students*
Sex:	
women	153 (68.0)
men	76 (32.0)
Age (median, range; y):	
women	25 (24-29)
men	25 (24-29)
Grade point average (mean±SD):†	
total	3.88 ± 0.48
women	3.90 ± 0.45
men	3.84 ± 0.55
Additional clinical skills training (n=50):‡	
women	27 (18.0)
men	23 (30.0)
Grade point average of students with additional clinical skill tranining (n=50):	
≥4.01	23 (29.0)
≤4.0	27 (18.0)

*Two questionnaires were excluded from the study because of missing, uninformative, or misleading answers.
†Scale from 2 – satisfactory to 5 – excellent.
‡Additional clinical skills training is defined as training in any skill outside regular curricula for more than 7 days in duration.

Participants and methods

Participants

Eligible participants were all medical students in their final (6th) year and medical doctors (teachers) involved in teaching clinical skills, who were employed as research-teaching staff at the Zagreb University School of Medicine, Zagreb, Croatia, in the 2004-2005 academic year. At the Zagreb School of Medicine, clinical training is provided within a sixth-year course through rotations in various clinical disciplines. The assessment process in clinical disciplines includes written and oral examinations, but not skills assessment.

The sample consisted of 229 students, representing 91% of the total of 252 final year medical students who graduated in the 2004-2005 academic year (Table 1), and 129 teachers representing 70% of all clinical teachers employed at Zagreb School of Medicine (n = 185) (Table 2). The choice of clinical disciplines was made on a presumption that clinical skills listed in our questionnaire should be learned during selected clinical rotations.

The students, 153 women and 76 men, were grouped according to sex, grade point average, and additional clinical skills training (Table 1). According to their academic performance, students were divided into two groups, one consisting of students with grade point average ≥4.01

(n = 79) out of possible 5 on a range from 2 (satisfactory) to 5 (excellent), and the other of students with grade point ≤4.0 (n = 150). Additional clinical skills training, which 50 students declared to have taken, was a category that we defined on a questionnaire as "training in any skill or group of skills outside the regular curriculum that lasted more than seven days." It included a variety of opportunities to improve clinical skills, such as summer exchange programs or volunteering in hospitals.

Among teachers, there were 42 women and 87 men, who were grouped according to their sex, academic position (instructor, associate professor, and professor), and surgical vs non-surgical specialty (Table 2). Due to the low number of professors willing to participate in our study, assistant professors and professors were analyzed as a single category (professor). Surgical specialties included general surgery; gynecology and obstetrics; ear, nose, and throat (ENT); orthopedic surgery; and urology. Non-surgical group of specialties included internal medicine; pediatrics; infectious diseases; neurology; dermatology; family medicine and anesthesiology; and emergency medicine.

Table 2. Basic descriptors of teachers involved in clinical skills teaching at the Zagreb School of Medicine

Teachers*	No. of teachers
Sex:	
female	42
male	87
Academic title:	
instructor	32
associate professor	36
professor	61
Surgical specialties:	
surgery	14
gynecology and obstetrics	13
ear, nose, and throat	11
orthopedics	8
urology	2
Non-surgical specialties:	
internal medicine	36
pediatrics	14
infectious diseases	11
neurology	7
dermatology	5
family medicine	5
anesthesiology and emergency medicine	3
Total	129

*Medical doctors employed as teaching staff at the Zagreb University School of Medicine.

Questionnaire

The questionnaire was given to students during their graduation exam in all examination periods between September 1, 2004, and September 1, 2005, to include all graduates in the 2004-2005 academic year. The students were asked to complete the questionnaire honestly because gathered data would be used in improving the quality of teaching clinical skills. Study investigators personally delivered the questionnaire to the teachers in the same period. To ensure anonymity, the researcher who delivered the questionnaires was not included in questionnaire processing. The questionnaire included all clinical skills graded 3 or 4 (*www.medu.au.dk)* and published as a suggested curriculum of practical clinical skills in undergraduate medical education, identified by the Delphi method (10). Anonymous questionnaire consisted of 99 clinical skills grouped in nine specialty groups: basic (22 skills); emergency (9 skills); neurology (12 skills); ENT (10 skills); cardiopulmonary (2 skills); gastrointestinal (5 skills); urological (6 skills); surgical (21 skills); and gynecology (12 skills). Students self-assessed their competence in clinical skills on a 0-5 scale. The scale was defined as follows: 0 – do not know (definition: a student does not know the procedure), 1 – know the principle (definition: a student read or was told how the procedure is done), 2 – observed (definition: a student has seen another person perform the procedure), 3 – supervised (definition: a student has done the procedure with a guidance of another person), 4 – acquired (definition: a student has independently done the procedure correctly), 5 – mastered (definition: a student has done the procedure correctly so many times that she or he feels both confident and competent about it). At the end of questionnaire, they were asked to declare (yes or no) if they had any additional clinical skills training as described above.

The questionnaire with same 99 clinical skills was given to the teachers. They were asked to score the minimum necessary clinical skill level

expected from a graduating medical student, using the same scale, so that their results could be compared with the criterion standard and students self-assessed level of clinical skills.

Statistical analysis

The mean for each group of skills was calculated by summing up all grades in the group and dividing it with number of skills in the group. Independent samples t test was used to test the differences in students' self-assessed level of skills according to their sex, grade point average, and additional clinical skills training, and to test differences in opinions of faculty members according to their sex and specialty. One-way ANOVA test was used to test the differences according to the academic status of teachers. Students' self-assessed skill level and teachers' opinions on minimum necessary clinical skills level were compared with the published criterion standard by using one sample t test. The level of statistical significance was set at P<0.05. Data were analyzed with MS Excel® program and SPSS 12.0 (SPSS Inc., Chicago, IL, USA).

Results

Student self-assessment scores

Two student questionnaires were excluded from the analysis due to clearly uninformative or intentionally misleading answers. In all nine groups of skills, students' self-assessment scores were lower than the published criterion standard (Table 3). Male students had higher scores than female students in emergency, neurology, ENT, urology, and surgery group of clinical skills (Table 3). No differences were found between students with grade point average ≥4.01 and those with grade point average ≤4.0 in scores in any group of skills. Previous training in any skill or group of skills outside regular curricula had a positive influence on self-assessment scores. Students that had additional clinical skills training had significantly higher scores in all groups of skills (P<0.001).

Teachers' expectations

In three groups of skills – basic, emergency, and neurology – teachers had significantly higher expectations in comparison to the published criterion standard (Table 4). In ENT and urology group of skills they had lower expectations (P<0.001, one sample t test). No evidence of differences in expectations was found between male and female teachers. Also, academic status did not have a significant influence on teachers' expectations. Comparison between surgical and non-surgical specialties did not reveal any significant difference between the two groups of teachers.

Table 3. Students' self-assessed level of their clinical skills according to sex, grade point average, and additional traning

	Score (mean±SD)									
			sex			grade point average			additional clinical skills training‡§	
Clinical skills	Criterion standard*	All students (n = 229)†	male (n = 76)	female (n = 153)	P‡	≥4.01 (n = 79)	≤4.0 (n = 150)	P‡	yes (n = 50)	no (n = 179)
Basic	4.0	3.8 ± 0.5	3.8 ± 0.4	3.8 ± 0.5	0.405	3.8 ± 0.5	3.8 ± 0.5	0.967	4.0 ± 0.5	3.7 ± 0.5
Emergency	3.3	2.2 ± 0.8	2.5 ± 0.9	2.1 ± 0.7	<0.001	2.1 ± 0.7	2.3 ± 0.8	0.103	2.7 ± 0.9	2.1 ± 0.7
Neurology	3.8	3.5 ± 0.6	3.6 ± 0.6	3.4 ± 0.6	0.017	3.4 ± 0.6	3.5 ± 0.6	0.635	3.7 ± 0.6	3.4 ± 0.6
Ear, nose, and throat	3.6	2.8 ± 0.7	3.1 ± 0.7	2.7 ± 0.7	0.002	2.8 ± 0.7	2.9 ± 0.8	0.399	3.2 ± 0.8	2.7 ± 0.4
Cardiopulmonary	3.0	2.5 ± 0.9	2.6 ± 0.9	2.5 ± 1.0	0.183	2.6 ± 1.0	2.5 ± 0.9	0.242	3.0 ± 1.0	2.4 ± 0.9
Gastrointestinal	3.4	2.5 ± 0.7	2.6 ± 0.7	2.5 ± 0.7	0.302	2.5 ± 0.6	2.5 ± 0.8	0.730	3.0 ± 0.7	2.4 ± 0.7
Urology	3.8	2.2 ± 0.8	2.4 ± 0.8	2.0 ± 0.8	0.003	2.1 ± 0.7	2.2 ± 0.9	0.810	2.6 ± 0.9	2.0 ± 0.7
Surgery	3.7	2.7 ± 0.6	2.9 ± 0.6	2.6 ± 0.6	0.002	2.6 ± 0.6	2.7 ± 0.6	0.689	3.1 ± 0.8	2.5 ± 0.5
Gynecology	3.2	2.3 ± 0.7	2.4 ± 0.8	2.2 ± 0.7	0.055	2.2 ± 0.8	2.4 ± 0.7	0.085	2.7 ± 1.0	2.2 ± 0.6

*Criterion standard was calculated from data presented in Moercke et al (10).
†P<0.001 vs criterion standard for all clinical skills (one sample t test).
‡P<0.001 for all (independent samples t test).
§Additional clinical skills training is defined in a questionnaire as training in any skill or group of skills beside regular curricula for more than 7 days in duration.

Table 4. Teachers' expectations about the level of medical students' clinical skills at the time of graduation

	Score (mean±SD)									
				sex			academic status			
Clinical skills	Criterion standard*	All teachers (n = 129)	*P*†	male (n = 87)	female (n = 42)	*P*‡	instructors (n = 32)	associate professors (n = 36)	professors (n = 61)	*P*§
Basic	4.0	4.4 ± 0.5	<0.001	4.3 ± 0.5	4.4 ± 0.4	0.472	4.4 ± 0.4	4.4 ± 0.6	4.3 ± 0.5	0.672
Emergency	3.3	3.7 ± 0.8	<0.001	3.6 ± 0.8	3.7 ± 0.7	0.507	3.7 ± 0.7	3.6 ± 0.8	3.7 ± 0.8	0.831
Neurology	3.8	3.9 ± 0.5	<0.001	3.9 ± 0.5	3.9 ± 0.6	0.722	3.8 ± 0.6	3.9 ± 0.6	4.0 ± 0.5	0.274
Ears, nose and throat	3.6	3.3 ± 0.8	<0.001	3.3 ± 0.8	3.2 ± 0.8	0.392	3.1 ± 0.9	3.4 ± 0.8	3.4 ± 0.7	0.149
Cardiopulmonary	3.0	3.1 ± 1.0	0.093	3.2 ± 1.0	3.1 ± 0.9	0.612	3.0 ± 1.0	3.1 ± 0.8	3.2 ± 1.1	0.703
Gastrointestinal	3.4	3.3 ± 0.7	0.165	3.3 ± 0.8	3.3 ± 0.7	0.755	3.1 ± 0.8	3.4 ± 0.6	3.4 ± 0.8	0.107
Urology	3.8	3.4 ± 1.0	<0.001	3.4 ± 1.0	3.3 ± 1.0	0.581	3.1 ± 1.1	3.5 ± 0.9	3.6 ± 1.0	0.058
Surgery	3.7	3.7 ± 0.7	0.694	3.7 ± 0.7	3.6 ± 0.8	0.639	3.4 ± 0.8	3.7 ± 0.7	3.8 ± 0.7	0.084
Gynecology	3.2	3.2 ± 0.8	0.618	3.1 ± 0.8	3.3 ± 0.8	0.299	2.9 ± 0.8	3.1 ± 0.7	3.3 ± 0.8	0.073

*Criterion standard was calculated from data presented in Moercke et al (10).
†One sample *t* test.
‡Independent samples *t* test.
§One-way ANOVA.

Comparison of Students' Scores and Teachers' Expectations

In all groups of skills, students scored their clinical skills significantly lower than the teachers expected ($P<0.001$ for all, independent sample *t* test) (Figure 1). In ENT and urology groups of skills, teachers had significantly lower expectations in comparison with the criterion standard, and student scores were even lower than the teachers' expectations (Table 4).

Discussion

Our study showed that students' perception of their own achievements differed from their teachers' expectations. Students tended to asses their skills much lower than expected by their teachers and published criterion standard. This difference was significant for both surgical and non-surgical specialties. Similar reports from Great Britain, Denmark, Netherlands, Belgium, and the US show that Zagreb medical students are not an exception (2,11-15). Low scores in all groups indicate that there is need for improvement.

Students had higher scores in some groups of skills, which can be explained by better organization of clinical skills teaching in these subjects, or by higher student interest in these skills. Male students had higher scores in "surgical special-

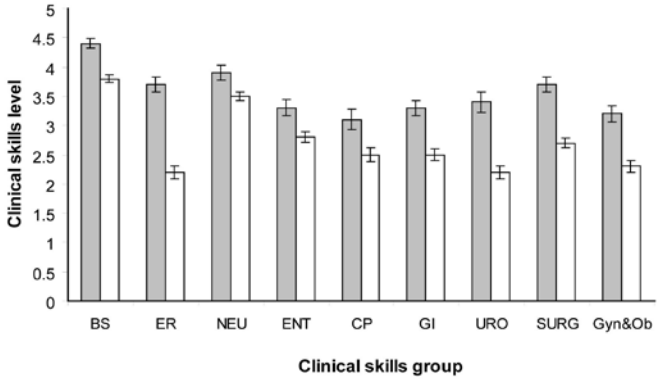

Figure 1. Differences between teachers' expectations and students' self-assessment scores at the Zagreb School of Medicine. Grey bars – teachers' expectations; open bars – students' self-assessment scores. Clinical skills score is presented as mean of the group of skills with 95% confidence interval as error bars. BS – elementary skills, ER – emergency skills, NEU – neurology skills, ENT – ear, nose, and throat skills, CP – cardiopulmonal skills, GI – gastrointestinal skills, URO – urology skills, SURG – surgery skills, Gyn&Ob – gynecology and obstetrics skills. $P<0.05$ for all groups of clinical skills (independent samples *t* test).

ties" probably because they were more inclined to these specialties, especially surgery, which is traditionally male-oriented (16). Grade point average had no influence on clinical skills level. Clinical skills are usually not a part of every clinical exam and do not influence the final grade. That clearly indicates the need for better evaluation of clinical skills if students' performance is to be improved. It is also safe to presume that the students who took additional clinical skills training, in a form of summer exchange programs or volunteer work in a hospital, are more interested in mastering practical skills. The education provided in such form gives them a significant advantage.

Although clinical skills training in our School is also provided by junior doctors and non-faculty members, we surveyed only faculty members employed as teaching-research staff because they are responsible for quality control of theoretical and practical teaching. The teachers' expectations in five groups of skills matched the criterion standard, exceeded the standard in three groups of skills and fell behind the standard in two groups of skills. That kind of diversity in results indicates the lack of consensus among the teachers. Wide 95% confidence intervals present even in the same specialty between teachers at the same academic position (data not shown) support this conclusion. However, our teachers' expectations show what will be expected from graduates when they become interns.

Wakeford and Roberts (17) showed that students may feel confident in performing a procedure without having experienced a number of successful attempts in specific skill. Their finding suggests that in our case, actual clinical experience of students is lower than that shown by their scores. Because of its accessibility and low cost, a questionnaire is often used to assess clinical competence (2), although the validity of self-assessed performance is found to be low or moderate (18). To objectively assess students' skills competence, comparative performance-based tests, such as the Objective Structured Clinical Examinations (OSCEs), are more appropriate but are rarely used because of their high cost (13). Thus, the actual level of clinical skills cannot be inferred from our study. The OSCE process also serves to identify areas of weaknesses in the curriculum and/or teaching methods, and thus serves as a mechanism to improve educational effectiveness as well as assessment tool for clinical skills (19). The strengths of our study are high response rate among students and responses collected from medical students who had finished all clinical rounds.

Medical curricula are changing all over the world (20), and many new approaches are being tested (21,22). In our Medical School, the Bologna Process has just been introduced and we believe that is a good opportunity for improving clinical skills teaching. Remmen et al (23) found that clinical clerkships did not automatically provide the perfect learning environment for medical students, who were often passive learners, taught mostly by junior doctors. Introduction of a checklist for procedural skills can increase exposure to practical procedures by about 30% (24). In some medical schools, clinical skills laboratory and assessment introduced early in the medical curriculum and combined with longitudinal skills training has been stimulating for students to improve their skills (25,26). On the other hand, some countries, such as the US and Canada, introduced the Clinical Skills Assessment (CSA) as a part of National Licensing Examination to obtain a better insight in clinical skills teaching (15). These attempts have shown that ideal path for teaching clinical skills is still not reached.

In conclusion, teachers expected higher level of clinical skills from students than that assessed by the students. Education during clinical rotations is not focused on clinical skills, but additional clinical skills training seemed to have positive influence on students' scores. There was no consensus among teachers on the level of clinical skills that need to be mastered by students dur-

ing undergraduate medical education, which indicates the need for implementing new solutions to help both students and teachers to improve clinical skills teaching.

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