Can medical schools rely on clerkships to train students in basic clinical skills?

Roy Remmen,[1] *Anselm Derese,*[2] *Albert Scherpbier,*[3] *Joke Denekens,*[1] *Ingeborg Hermann,*[1] *Cees van der Vleuten,*[3] *Paul Van Royen*[1] *& Leo Bossaert*[4]

Objective Many medical schools have drawn up lists of basic clinical skills that students are required to have mastered at the end of medical training. To determine whether undergraduate students actually perform these basic clinical skills during clerkships and whether different approaches to skills training led to different results, we surveyed 365 final-year medical students in 1996 and 1997.

Method A questionnaire containing items on 265 skills in eight body systems was administered to students from two conventional medical schools (Ghent and Antwerp, Belgium), and one Dutch medical school, Maastricht, which offers a problem-based curriculum and systematic skills training.

Results Although quite a few skills were not performed by Maastricht students, the results of this school compared favourably to those of the Ghent and Antwerp medical schools. Significant differences between Ghent and Antwerp were found for surgery, paediatrics and gynaecology/obstetrics. In the non-obligatory clerkships in dermatology, otorhinolaryngology and ophthalmology a great percentage of skills were not performed.

Conclusions The main conclusion is that all three medical schools cannot rely on clerkship experiences alone to provide adequate basic skills training. A problem-based learning environment and training in a skills laboratory appear to result in students performing more skills during clerkships. Assessment of clinical skills, obligatory clerkships in specialties and general practice, and continuous monitoring of the quality of clerkships may also be strong determinants of the present findings.

Keywords *Clinical clerkship; medical students; educational measurement; *clinical competence.

Medical Education 1999;33:600–605

Introduction

One of the objectives of the undergraduate medical curriculum is to provide students with the knowledge, skills and attitudes required for entering every speciality training.[1] This implies that junior doctors should master elementary clinical skills that are of vital importance for daily clinical work. Some authors suggest that the undergraduate curriculum fails to fulfil this expectation, despite students' extensive exposure to clinical work during clerkships.[2] National authorities in some countries have addressed this problem and medical schools have been encouraged to promote training of basic clinical skills.[1,3]

Some of the proposed solutions for deficiencies in undergraduate training have been implemented in new undergraduate curricula, in which a mix of teaching strategies including problem-based learning, community-based education and skills laboratories have been introduced. Recently, some conventional schools have composed lists of basic clinical skills, mostly through consensus procedures among clinical staff.[4] So the 'intended' curriculum is defined but little is known of the extent to which this matches the 'curriculum in action'. In other words, it is uncertain whether students do indeed perform the listed basic skills during their clerkships. It has been suggested that there may be a mismatch between the skills students are intended to perform and the skills students actually encounter during clerkships.[5]

[1]Department of General Practice, University of Antwerp, Belgium.
[2]Department of General Practice, University of Ghent, Belgium.
[3]Faculty of Medicine, University of Maastricht, The Netherlands.
[4]Department of Medicine, University of Antwerp, Belgium.

Correspondence: Roy Remmen, general practitioner, Department of General Practice, University of Antwerp, Universiteitsplein 1, 2610 Belgium.

The present paper is part of the research project 'Case study of the intended, taught and learned curriculum of basic clinical skills at the medical faculty of the University of Antwerp'. This project was funded by the Province of Antwerp (Belgium) and the National Fund of Scientific Research (Belgium).

We surveyed final-year medical students to determine whether students performed the intended basic clinical skills during clerkships. Our first working hypothesis was that not all basic skills are performed during clerkships. After analysing the results obtained from the Antwerp and Ghent medical schools in 1996, we surveyed students from these universities and from a third medical school (Maastricht) in 1997.

We hypothesized that students perform more skills during clerkships, if they are better prepared by the pre-clinical curriculum and the learning environment is more supportive, as is the case in the problem-based curriculum at Maastricht.

Context of the study

The Faculties of Medicine of the Universities of Ghent and Antwerp (Belgium) may both be classified as conventional medical schools. The curriculum starts with three years of predominantly basic medical science and some theoretical clinical courses. Then students enter the four-year clinical period in which considerable time is dedicated to junior and senior clerkships. Ghent students do four junior clerkships: internal medicine, surgery, paediatrics and general practice. There are four compulsory junior clerkships at Antwerp, i.e. internal medicine, surgery, gynaecology/obstetrics and paediatrics, and seven elective clerkships which students can select from various subspecialties and general practice.

Both medical schools have 10 months of senior clerkships dedicated to internal medicine, surgery, gynaecology/obstetrics and paediatrics followed by two months that students can spend on other specialties, mostly ones that reflect their future career plans. Some 50% of students spend one month in general practice. Neither Antwerp nor Ghent assesses students' clinical skills during or after clerkships. Clinical teaching is not financially rewarded as an identified task. Both universities use an audit system to monitor the quality of clerkships.

Faculty at Antwerp medical school reached consensus about a list of skills defining the minimum amount of experience required. This skills list contains very elementary skills and was built upon existing skills matrices.[3,4] To stimulate skills training during clerkships, the list has been included in logbooks issued to all senior students at Antwerp, starting from immediately before data collection in 1996.

The third medical school to participate in this study was that of Maastricht University (the Netherlands). This school has a 6-year problem-based curriculum. In contrast to the schools of Ghent and Antwerp, clerkships in dermatology, otorhinolaryngology, ophthalmology, neurology, psychiatry and general practice are mandatory. Clinical skills training is offered throughout the first four pre-clinical years of the curriculum until the start of full-time senior clerkships in years 5 and 6. Teaching objectives are outlined to students from the beginning of undergraduate training.[6] During both the pre-clinical and the clinical years students are formatively and summatively assessed with an Objective Structured Clinical Examination.[7] Senior clinicians, including general practitioners, are financially rewarded for teaching tasks. All clerkships are continuously audited on the basis of student opinions.[8]

Methods

Instrument

A questionnaire was developed using the basic clinical skills list developed at Antwerp medical school. For this study we selected locomotor skills and simple procedures that students are required to perform 'at least once' or that 'should be mastered routinely' according to the Antwerp skills list.

Skills were classified according to body systems and in relation to clinical disciplines. The 'general' system comprises 83 skills that can be performed routinely during activities on the wards in many disciplines. Therefore, it contains many general internal skills. The other systems are surgery (29 skills), paediatrics (19 skills), gynaecology/obstetrics (19 skills), neurology (43 skills), dermatology (12 skills), otorhinolaryngology (26 skills) and ophthalmology (34 skills). Examples of the skills in the questionnaire are given in Table 1.

Students were asked to rate their clerkship experience with respect to each skill on a nominal scale with four

Table 1 Examples of skills in the questionnaire

General skills
Assessment of consciousness
Inspection of respiration
Measurement of blood pressure
Measurement of length and weight
Surgical skills
Palpation arterial pulsations
Testing capillary refill
Incision of abscess
Wound-stitching
ENT
Inspection ear and mastoid bone
Inspection ear channel with otoscope
Inspection eardrum with otoscope
Use of tune fork

levels: level 1 (not demonstrated to student and not performed by student), level 2 (demonstrated to student, but not performed by student) relating to passive experience, level 3 (performed once by student) and level 4 (performed more often) relating to active experience. We asked students to consider their experiences during junior and senior clerkships in answering the items, but to disregard their experiences in skills laboratory training or introductory courses.

Subjects

We surveyed all Ghent and Antwerp final year students during a lecture at the end of clerkships in the academic years 1996 and 1997. At Maastricht students graduate in small groups at a time, and there are no lectures in the final year. Therefore, a questionnaire was mailed to the first 35 students graduating from September 1996 onwards and no reminders were sent. The students could complete the questionnaire anonymously.

Statistical analysis

We dichotomized scores by combining levels 1 and 2 and levels 3 and 4 of the nominal scale to two levels: 'not performed' and 'performed', and expressed them as percentages per body system. Frequency distributions were first analysed by university and by body system.

To test for differences between faculties χ^2 (Yates corrected when appropriate) were calculated for the total numbers of skills performed and not performed, respectively. A P-value $< 0{\cdot}01$ was considered statistically significant. This procedure was repeated to test for differences between body systems.

Results

The response rate varied from 66% for the postal questionnaire sent to the Maastricht sample to 82% for the Antwerp students in 1997. Table 1 shows subjects and response rate per year and university.

Summary statistics are given in Table 2. This table shows differences between and within universities. On average, Maastricht students perform 87·1% of all skills, while students of Ghent (64·5%) and Antwerp (68·6%) perform significantly less. The difference between Ghent and Antwerp was small but statistically significant.

With regard to body systems, Maastricht students performed between 72·7% (dermatology) and 95·7% (neurology) of skills. Ghent and Antwerp students reported performing fewer skills for all body systems compared to Maastricht students.

Table 2 Number of subjects and response rate

Medical school	Number of students	Returned questionnaires	Response (%)
Ghent 1996	128	98	77
Ghent 1997	124	90	73
Antwerp 1996	107	83	78
Antwerp 1997	87	71	82
Maastricht 1997	35	23	66
Total	481	365	

For five of the eight systems (general, surgical, paediatric, gynaecologic/obstetric, and ophthalmologic) Antwerp students performed significantly more skills compared with students at Ghent. The difference was greatest for gynaecology/obstetrics (Antwerp 74·0% and Ghent 59·8%).

Discussion

Methodological considerations

A drawback of this study is that students had to rely on their memories to complete the questionnaire. Furthermore, the instrument may have introduced bias into the comparison between the three medical schools. Firstly, Maastricht students may have had the advantage over their Belgian colleagues in that the instrument may have induced better recall, due to extensive basic clinical skills training and assessment throughout the Maastricht curriculum. Secondly, Antwerp students may have recognized the skills included in the questionnaire from the skills lists provided to them. This puts Ghent students at the greatest disadvantage compared with their Maastricht and Antwerp counterparts.

The 66% response rate of Maastricht students appears acceptable for postal data collection but was lower than that for the Belgian students. We were unable to determine if the response at any university was biased towards more motivated students.

The present study only investigated whether students performed skills during clerkships. The quality of their training was not studied. On the basis of the present findings no assumptions can be made about the quality of skill competence. However, it has been shown basic skill performance the students of students at the two traditional schools was not optimal.[9]

It has been argued that performing skills without supervision or feedback increases confidence, but not competence.[10] To study both the amount of skills performed and the quality of training (i.e. the amount

Table 3 Summary statistics. Percentage of skills per body system performed or not performed, a = significant difference ($P < 0.01$) Antwerp compared to Ghent, b = significant difference ($P < 0.01$) Ghent compared to Maastricht, c = significant difference ($P < 0.01$) Antwerp compared to Maastricht

Body system	Ghent (N = 188)	Antwerp (N = 154)	Maastricht (N = 23)	$P < 0.01$
General	77.0	79.7	88.2	abc
Surgery	61.6	70.1	81.3	abc
Paediatrics	73.3	78.4	85.1	abc
Gynaecology/obstetrics	59.8	74.0	85.7	abc
Neurology	71.7	72.5	95.7	bc
Dermatology	46.1	47.1	72.7	bc
Otorhinolaryngology	57.6	57.1	84.7	bc
Ophthalmology	36.4	43.1	87.1	abc
All skills	64.5	68.6	87.1	abc

of feedback students receive), other instruments must be used, such as logbooks,[11] which are more difficult to use and more expensive. To assess students' skills competence comparative performance-based tests, such as the Objective Structured Clinical Examinations (OSCEs), are more appropriate.[12]

Results

The 'intended curricula' of the three participating universities aim to offer all students the opportunity to perform all skills of all body systems that are included in the basic skills list at least once during their clerkships. Maastricht students come closest to this ideal with 87·1% of all skills performed. However, this percentage reveals also that even at Maastricht many skills are not performed by students. This applies in particular to dermatology and, albeit to a lesser extent, surgery. The findings, with respect to the two-month surgical clerkship, show that exposure to clinical work fails to offer students sufficient opportunities to perform or observe skills. It may be concluded that some skills are difficult to train during clerkships. Also, the finding that no school was able to reach 100% coverage raises the question of how 'core' the skills in this study are. The core has, up until now, been defined in terms of desirability and perceived relevancy for clinical training, and is mostly the result of consensus procedures among senior faculty. According to our data however, clinical training seems not to meet these intended goals.

The overall favourable results of Maastricht students are comparable to those of an earlier study where Maastricht students reported performing more skills compared to students studying a conventional curriculum. Because these schools were comparable with respect to clerkship organization and exposure to clerkships, the differences could be attributed to three factors. Firstly, the systematic attention to skills training and assessment at Maastricht,[6] and, secondly, the problem-based-learning environment may have led to different learning strategies during clerkships.[13] The possible effects of these two teaching strategies need more clarification, because conclusive evidence of their effectiveness is still lacking. Thirdly, the continuous monitoring of the quality of the clerkships may have played a role.[8]

The most important finding in this study is that Antwerp and Ghent students report performing significantly fewer skills for all body systems compared to Maastricht students. Some trends can be observed and particular factors may explain differences between faculties.

The comparatively high scores in the 'general' system in all three medical schools may reflect the large amount of time spent on wards. Senior students in all three universities see many new patients and perform the general physical examination on admission of a patient. Although statistically significant, the difference between Ghent and Antwerp students is small (2·7%), particularly compared to the large difference vs. Maastricht students. This large difference does indeed suggest that factors other than plain exposure to clinical work are responsible.

Even though clerkships in surgery, paediatrics and gynaecology/obstetrics are obligatory in all three medical schools, the skills related to these clerkships are performed less often at Ghent and Antwerp compared to Maastricht. The higher scores of Antwerp compared to Ghent may be explained by elective clerkships during the junior period in Antwerp (giving them more expo-

sure) and the somewhat extended skills training sessions. The relatively large difference concerning the skills of gynaecology/obstetrics means that factors relating to the learning environment in the clerkships have to be taken into account, especially because the quality of teaching opportunities seems to vary across hospital departments.[8,14]

With respect to the majority of skills related to neurology, dermatology, otorhinolaryngology and ophthalmology, the results at Ghent and Antwerp fall far below the objectives of the 'intended' curricula at these medical schools. This is not surprising as clerkships in which these skills can be learned are not compulsory at either university. Approximately 30–50% of students choose one, and, exceptionally, more than one of these specialties. Two specialties, neurology and otorhinolaryngology, show relatively favourable outcomes. Some neurological skills may be picked up during clerkships in internal medicine and surgery, and some otorhinolaryngology skills may be trained in paediatrics. Training opportunities related to both body systems may occur in general practice, which is undertaken by 50% of all senior clerks at Ghent and Antwerp and which is a compulsory junior clerkship at Ghent. Hence, although the 'intended' curriculum requires all students to master the skills in these areas, both schools fail to deliver adequate training activities to meet this goal.

Both Antwerp and Ghent medical schools will implement curricular changes to remedy the current situation. These will at least consist of skills training sessions early in the curriculum in the medical school of Antwerp and special arrangements to compensate for perceived lacks in skills relating to non-compulsory clerkships during the senior clerkships and implementation of a logbook and skills lists in the medical school of Ghent. The questionnaire we used in this study may be used as one of the instruments to monitor these curricular changes.

Conclusion

The results of this study show that not all required skills are practised during clerkships. This suggests that medical schools cannot rely on clerkship experiences alone to offer students adequate basic clinical skills training.

The differences between faculties suggest that a problem-based learning environment, skills laboratory training and assessment of clinical skills during preclinical years prepare students more effectively for performing skills, and that continuous evaluation of clerkship may enhance these effects. The present data do not allow conclusions regarding the extent to which these factors influence results and more research is needed to clarify these issues. Obligatory clerkships in specialties and general practice obviously offer more training opportunities for many elementary skills.

We recommend more and systematic attention to skills training and assessment in conventional curricula in order to optimize students' skills training opportunities during clerkships and to prevent them from becoming 'a competent doctor despite undergraduate training rather than because of it'.[15]

Acknowledgements

We are much obliged to our students who were willing to participate in this study. We thank Professor Johan Kips and Professor Jan De Maeseneer, Ghent University and also Professor Anders Bearheim, University of Bergen (Norway) for their interest and helpful comments and Mereka Gorsira for final textual review.

The list of skills that was used in this study can be downloaded from http://gen-www.uia.ac.be/u/remmen/

References

1 General Medical Council. *Tomorrow's doctors. Recommendations on Undergraduate Medical Education.* London: General Medical Council; 1993.

2 McManus IC, Richards P, Winder BC. Clinical experience of UK medical students. *Lancet* 1998;**351**:802–3.

3 Metz JCM, Stoelinga GBA, Pels Rijcken-Van Erp Taalman Kip EH, Van den Brand-Valkenburg BWM. *Blueprint 1994 training of doctors in the Netherlands. Objectives of undergraduate medical education.* Nijmegen: University Publication Office; 1994.

4 Dacre J, Nicol M. The development of a clinical skills matrix to plan and monitor contemporary teaching of doctors and nurses. *Med Teacher* 1996;**17**:318–23.

5 Coles CR, Grant JG. Curriculum evaluation in medical and health-care education. *Med Educ* 1985;**19**:405–22.

6 Scherpbier AJJA. *Kwaliteit van vaardigheidsonderwijs gemeten* [dissertation]. Maastricht: Universitaire Pers Maastricht; 1997.

7 Harden R, Gleeson F. Assessment of clinical competence using an objective structured clinical examination (OSCE). *Med Educ* 1979;**13**:41–54.

8 Wolfhagen HAP, Gijselaers WH, Dolmans DHJM, Essed G, Schmidt HG. Improving clinical education through evaluation. *Med Teacher* 1997;**19**:99–103.

9 Remmen R, Scherpbier AJJA, Derese A, Denekens J, Hermann I, van der Vleuten CPM, Van Royen P, Bossaert L. Unsatisfactory basic skills performance by students in traditional medical curricula. *Med Teacher* 1998;**20**:579–82.

10 Marteau TM, Wynne G, Kaye W, Evans TR. Resuscitation: experience without feedback increases confidence but not skill. *BMJ* 1990;**300**:849–50.

11 Ferrell BG. Demonstrating the Efficacy of the Patient Logbook as a Program Evaluation Tool. *Acad Med* 1991;**9**:S49–S51.
12 Stillman P, Regan M, Swanson D, Case S, McCahan J, Feinblatt J, Smith SR, Willms J, Nelson D. An Assessment of the Clinical Skills of Fourth-Year Students at Four New England Medical Schools. *Acad Med* 1990;**65**:320–6.
13 Schwartz RW, Donnelly MB, Blue AV, Sloan DA, Nash PP, Mayo P. Students' use of time in a problem-based learning surgery clerkship. *Med Teacher* 1997;**19**:15–8.
14 Rolfe IE, Pearson S, Sanson-Fisher R, Fardell SD, Kay FJ, Gordon J. Measuring the hospital experiences of junior doctors. *Med Educ* 1998;**32**:312–9.
15 Fraser RC. Undergraduate medical education: present state and future needs. *BMJ* 1991;**303**:41–3.

Received 28 *October* 1998; *editorial comments to authors* 3 *February* 1999; *accepted for publication* 11 *March* 1999

Does it matter where you go to medical school?

In this issue of *Medical Education* Remmen and colleagues from Antwerp, Ghent and Maastricht have carried out a comparative study of the three curricula at their respective medical schools focusing on the attainment of clinical skills. Using a list of clinical skills objectives assembled by the Antwerp faculty, they compared by mailed questionnaire, the extent to which the clinical skills objectives were being met by the students. They used the measure of performance of a clinical skill at least once as the criteria for attainment of the objective.

They demonstrated that students at Maastricht reported that they had performed significantly more of the 265 skills queried than did the students in Ghent and Antwerp. Maastricht students also performed significantly more skills in each of the eight categories analyzed than did their counterparts. The main limitations of this study are twofold. First, both the sample size and response rates form Maastricht were small compared to the other two schools. Second, it is impossible to point to which of many curricular differences between Maastricht and the two 'conventional schools' of Ghent and Antwerp, might be responsible for any outcome differences seen in this study. These limitations, which are readily acknowledged by the authors, do not detract from the main messages.

The first and I believe most important message, is that 'curricular intent' needs to be monitored by a rigorous audit of what students actually achieve. It is revealing that, notwithstanding the fact that the skills list was compiled by Antwerp faculty, their students faired less well in the attainment of these skills than did the Maastricht students. In this regard, every so often, any curriculum needs a 'reality check' on whether the faculty's expectations are realistic.

The next issue that emanates from this study is the reasons why Maastricht students faired so much better. There are many explanations that the authors offer, including a shift to a problem-based learning (PBL) curriculum, early clinical exposure, specific skills laboratory-based clinical training and the use of performance-based testing. Indeed, any of the above differences between the Maastricht and 'conventional' curricula could easily explain the observations made in this study. Likely, the incorporation of laboratory-based skills training, which usually includes the opportunities for students to practice clinical skills in conjunction with standardized patients,[1] is operative as a main reason for the findings. Further to this, it is likely that the emphasis that the Maastricht faculty has placed on clinical skills attainment and evaluation has created an atmosphere which is conducive to Maastricht students recalling more vividly their clinical skills experiences.

It has now been about a decade since a significant number of medical schools around the world have adopted PBL as a curricular model.[2] Many such schools are now taking an important look at whether the initial objectives of radical curricular change are being met. It is reassuring that, for whatever reason, a school like Maastricht appears to be fairing very well on this particular dimension of clinical competence.

The omission of specific clinical skill performance in medical schools should be particularly sobering. More and more, especially in North America, opportunities for general training in which a broad array of clinical skills not learned in medical school can be learned during graduate medical education are diminishing. What the medical student does not learn in medical school may never be addressed thereafter. This is of particular concern to educators who firmly believe there is an array of basic skills that all doctors should possess, regardless of specialty.

Despite the small sample size of Maastricht students, the authors of this paper have appropriately highlighted that it may be unreasonable to expect that the clinical skills intended to be acquired during clerkship will necessarily be acquired. This may be especially true in schools that have a significant proportion of clinical training time devoted to elective clerkships. It is likely that gaps in clinical skill training will be most successfully addressed by a combination of performance-based testing and specific laboratory-based training coupled with a program of ongoing curricular analysis and revision.

Correspondence: Dr Richard Reznick, Director, University of Toronto, Faculty of Medicine, Centre for Research in Education, The Toronto Hospital, 585 University Avenue, B6–600, Toronto, Ontario M5G 2C4, Canada

Richard Reznick
Centre for Research in Education
at University Health Network
University of Toronto, Faculty of Medicine

