

## University of Groningen

### The clinical learning environment

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## Chapter 7

General discussion





The learning environment as perceived by the student has already been shown to be an important factor which influences student learning processes.<sup>1,2</sup> Three main themes concerning the clinical learning environment were addressed in this dissertation. First, the transition difficulties students experience when switching from pre-clinical to clinical training were analysed and the consequences of a newly developed dual learning programme were determined. Second, the time students spend on clerkship activities and the relationship between student time allocations and their perceptions of the quality of their clinical learning environment were analysed. Third, the influence of several feedback characteristics was established and the use of the digital pen in providing students and faculty with suitable feedback was explored.

In this chapter conclusions from the detailed research questions and hypotheses are reconsidered for each theme. In the part on student time allocations to clerkship activities some new data will be presented that could not be incorporated into one of the previous chapters but which nonetheless fit the general theme of this dissertation. Furthermore, methodological considerations, the implications of our findings and recommendations for further research will be provided.

## **TRANSITION FROM PRE-CLINICAL TO CLINICAL TRAINING**

In Chapter 2 a baseline measurement was described with respect to the perceived difficulty of the transition from pre-clinical to clinical training. This study was performed on the former curriculum, where all skills training was provided in the years preceding the clerkships. The aims of this study were to investigate the influence of the students' preclinical knowledge and skills levels on the perceived difficulty of the transition period and to explore the influence of transition difficulties on student clerkship performance. In Chapter 3 a comparable study was described, which was performed on the new curriculum. This curriculum included an innovative dual learning programme which aimed to ease the transition

from pre-clinical to clinical training. This study focussed on the students' satisfaction with their workload because this was the main transition difficulty students reported in the baseline measurement. Since skills training was rearranged in the new curriculum, the students' satisfaction with their skills levels was also examined. Furthermore, the students' overall stress levels were measured. Throughout the dual learning year, skills training and clerkships alternated, resulting in four skills training periods, each followed by a clerkship. We expected that providing skills training immediately before the students applied these skills to a clerkship would ease the transition. Consequently, we hypothesized that as students progressed through the dual learning programme their satisfaction with their workload and skills levels would increase and their stress would decrease. Furthermore, in this study the measures in the dual learning year were compared to the baseline measures and it was hypothesized that students in the dual learning programme would experience fewer transition difficulties than students whose transition occurred in a curriculum where all skills training is provided before the clerkships.

### **Findings and discussion**

The results of Chapter 2 showed a limited influence of the students' pre-clinical knowledge and skills on the difficulty of the transition as perceived by the students. This suggested that increasing the students' pre-clinical knowledge and skills barely eases the transition. Stress can be conducive or inhibitive to learning. A certain amount of stress can be a powerful motivator. However, if the level of stress becomes too high, it may negatively influence students' performance. It was found that perceived transition difficulties had no influence on the students' performance at the second clerkship week of their first clerkship and not on their overall performance during their first clerkship. So neither the positive effects of stress on students' performance, nor the negative effects of stress on students' learning were found in this study. If transition difficulties do not influence the students' clinical performance scores, it could be argued that transition difficulties do not hamper student learning during clerkships. However, the study results also indicated a lack of transfer of pre-clinical

knowledge and skills to the first clerkship. Pre-clinical training is aimed at teaching students competences that fit the clinical context and it is desirable for students to use these competences during their clerkships. Consequently, we would expect students with higher scores on knowledge and skills tests before the start of their first clerkships to also perform better during their clerkships. Nevertheless, it was found that students' pre-clinical knowledge and skills levels did not influence their performance after two clerkship weeks. The students' overall clerkship performance (after 14 clerkship weeks) was influenced by their pre-clinical knowledge and skills levels. To summarize, in the baseline measurement a deficiency in the transfer of pre-clinical knowledge and skills was apparent after two clerkship weeks. After 14 clerkship weeks, students took more advantage of their pre-clinical knowledge and skills. However, the influence of their pre-clinical learning outcomes on their clinical performance scores was rather moderate.

In the dual learning programme presented in Chapter 3, the students' satisfaction with their workload and skills levels increased and their stress decreased as they progressed through the programme. Compared to the baseline measurement, the students' satisfaction with their workload was found to be higher from the very start and over the whole dual learning year. In the baseline measurement all skills training was distributed across the pre-clinical years of medical training. In the dual learning programme skills training was largely concentrated in the fourth year of medical training. At the start of the first clerkship, the students who participated in the baseline measurement had received much more skills training than students in the dual learning programme at the stage of their first junior clerkship. Therefore, it not surprising that the latter experienced lower satisfaction with their skills levels. However, once these students were in their second junior clerkship, they had made up the arrears. The students' mean stress level at the end of the dual learning year was relatively low compared to the results of previous studies in medical education.<sup>3-7</sup> To conclude it seems that alternating skills training and clerkships increases

student workload satisfaction during the transition, without making concessions on the students' satisfaction with their skills levels.

A subject of discussion is the comparison of both curricula. Due to the complete curriculum reform it is difficult to point out an exact point in time on which the baseline measurement and the dual learning programme should be compared. In the baseline measurement one transition was apparent which led to a measurement at a single point in time. In the dual learning programme students experienced several transitions which resulted in an overview of the whole year. Consequently, no data were available on how the students in the baseline measurement developed in the course of their first clerkship year. On the one hand these students only experience one transition so only one measurement on transition difficulties can be provided. On the other hand, a longitudinal measure of the students' general stress levels in the baseline measurement would have provided useful data for comparing both curricula.

### **Methodological considerations**

While discussing the studies on transition difficulties, some methodological drawbacks can be noted. We chose to ask students to fill out a questionnaire on perceived transition difficulties during their second clerkship weeks. It is open to debate whether this is the ideal moment for completing this questionnaire. Do students have enough experience in their new clerkship environment to judge the difficulty of the transition? How long does the transition from pre-clinical to clinical learning actually take? We could also consider whether there would be different outcomes if students were asked to complete the questionnaire during their first or third clerkship weeks. To be able to make a valid comparison between the baseline measurement and the measures in the dual learning year, we took care to ensure that all students filled out the questionnaire in the same week. However, it was logistically impossible to ask the 100 students who participated in the baseline measurement and who were in eight different hospitals to fill in a questionnaire on the same day of the week. Consequently, it is possible that some students completed the questionnaire

at the start of their second clerkship week and others at the end of this week. It is unknown whether and how these differences influenced the study outcomes. However, students in the dual learning programme were all asked to fill in the questionnaire at the same moment, which was after one and a half weeks of clerkship experience.

There may be doubts about the reliability of the clinical performance scores presented and discussed in Chapter 2. The performance scores students obtained in their second clerkship weeks (transition performance) were awarded by a single doctor, which may seriously affect the reliability of this measurement. Furthermore, clinical staff may have taken the students' transition difficulties into account when grading them. The students' 'transition performance' scores would thus barely differentiate between excellent and poorly performing students. Consequently, the possible influence of other variables on these performance scores is difficult to determine. This drawback is less prominent when considering the students' overall performance scores for their first clerkships. These scores were based on seven clinical evaluations which were mostly performed by different doctors, which means that they will most likely be sufficiently reliable for the analyses performed.

The cross-sectional design described in Chapter 3 is another methodological point of interest. We chose to use a design in which the students were only asked to fill out the questionnaires concerning their satisfaction with their workload and their skills levels and stress once. This was done to prevent questionnaire fatigue among students, which might negatively influence the measurements. On the other hand, this choice implies that the data gathered are not purely longitudinal, which means that the differences presented between mini-transitions may partly be caused by differences between the groups of students participating in the individual mini-transitions. However, since there are no reasons to assume that groups of students differ in aspects other than mini-transition, the chances of this design causing the significant trends and differences observed is limited.



### **Implications and further research**

The transfer of competences from a learning to a working context is one of the main purposes of education. Usually, we assume that students will incorporate the knowledge, skills and behaviours they learn during pre-clinical training and automatically apply them during their clinical training period. However, the study presented in Chapter 2 showed that the students' pre-clinical learning outcomes were barely related to the students' clinical performance scores. Consequently, the transfer of competences is not that obvious. To ease the transition from pre-clinical to clinical training it is necessary to stimulate this process of transfer.

Easing the transition from pre-clinical to clinical training is one of the major challenges in medical education. The importance of this phase of medical training is reflected in various curricular innovations and local implementations. Basic and clinical sciences were integrated, the focus on acquisition of knowledge was replaced by the achievement of competences and many medical schools have changed their education programme to a Problem-Based Learning curriculum.<sup>8,9</sup> So far, it has generally been considered impracticable to breach the strict division of training at university and training at the hospital. In the recent past, different local innovations were implemented to ease the transition from pre-clinical to clinical training. In the Netherlands, the Universities of Leiden and Maastricht have published on their educational implementations aimed at easing transition difficulties.<sup>10-13</sup> Parts of these data confirmed the importance of integrating skills training and clerkships.<sup>10,13</sup> However, the division between pre-clinical and clinical training still remained. By implementing a dual learning programme at the University of Groningen we have shown how the division can be reduced. Though further research is necessary to prove other beneficial effects of dual learning, we feel justified in recommending implementation of this learning programme.

Further research on the transition from pre-clinical to clinical training is needed in different domains. The results of Chapter 2 seem to reveal that there was a lack of transfer during the first two weeks of the students' first

clerkship. This may be caused by the low satisfaction students had with their workload. However, clear evidence could not be provided. Because the students' satisfaction with their workload is more positive in the dual learning year and their satisfaction with their skills was comparable to the first study, we expect that the transfer of knowledge and skills will improve. Future studies are needed to determine whether the dual learning programme supports the actual transfer of competences better than a curriculum in which skills training is provided in the years preceding the clerkships. As mentioned, previous studies have already described other curriculum innovations, such as professional skills and communication training, medical skills laboratory and adoption programmes, aimed at decreasing transfer difficulties.<sup>10-13</sup> It would be useful to compare different curricula and examine whether there are differences between the curricula in the perceived difficulty of transition. Future studies should analyse the different variables relating to transition difficulties in one model. In addition to the transfer of competences, the influence of student characteristics – for example learning styles – and clinical supervision should be incorporated into such a model.

## **TIME SPENT ON CLERKSHIP ACTIVITIES**

A previous study in undergraduate clinical training aimed at illuminating which factors could explain differences in clinical learning environments.<sup>14</sup> The first factor was called 'legitimacy'. This factor indicated that students were more satisfied with their clinical learning environment when they were actively involved in all kinds of activities. However, it was unknown which activities related to a positive perception of the learning environment. If student participation in specific clerkship activities is related to a more positive perception of the clinical learning environment, the time students spend on different clerkship activities can be used to improve the quality of the clinical learning environment. In the study described in Chapter 4 we attempted to determine the time students spent on different clerkship activities and to analyse the relationship between the

students' time allocations and their perceptions of the quality of the clinical learning environment.

### **Findings and discussion**

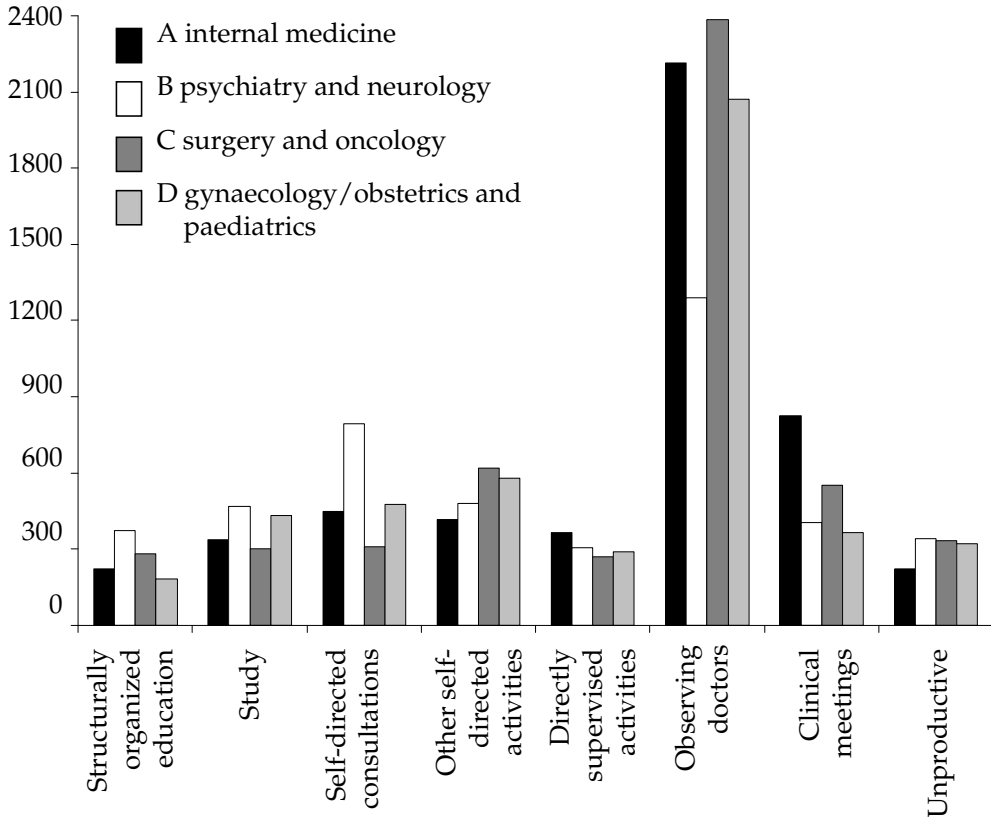
It was found that students spent nearly eight hours a day on the eight pre-defined clerkship activities. Most time was spent observing doctors. The time students spent on observing doctors, self-directed consultations and directly supervised activities was positively related to their perceptions of the quality of the clinical learning environment. These outcomes can be summarized as activities in which students have direct patient contact. Self-directed consultation and supervised activities were also activities in which the students were very active. It is striking that observing doctors was also positively related to students' perceptions of the quality of their clinical learning environment. None of the other activities showed a negative relationship. We assume that students learn more by doing rather than by observing others. Consequently, it would be expected that the more time students spend on activities in which they are active, the more positive they will be about the quality of their clinical learning environment. Therefore, it is remarkable that the time students spend on self-directed consultations and on observing doctors was related to the students' perceptions of their clinical learning environment, without one relationship exceeding the other. It is possible that undergraduate students who have relatively little experience in the hospital benefit from doing and from observing others. At the same time, this finding showed the importance of clinical supervisors demonstrating their expertise.

In the second chapter students were asked to indicate how satisfied they were with the workload they experienced during the transition from pre-clinical to clinical training. However, no research findings on the actual time students spent in their first clerkship were presented. In addition to the previous theme of this dissertation on the transition to clinical training, we performed supplementary analyses to investigate the differences in time allocations between clerkships. These clerkships were part of the former curriculum studied in Chapters 2 and 4. Differences were determined in the

total time students spent on the activities (Figure 1). Students in their first and third rotations (both 8.4 hours a day) spent 30 to 60 minutes per day more on the activities than students in their second and fourth rotation (7.4 and 7.8 hours a day). In addition, differences occurred at the level of actual clerkship activities. These differences may be largely explained by the underlying disciplines and by the students' clerkship experience. It appeared that once students had spent over three and a half hours a day observing doctors during their first rotation, they managed to spend less time observing doctors during their second rotation (2.2 hours a day). Students in their second rotation spent relatively more time on self-directed consultations (1.3 hours a day). Once students had spent more time observing doctors during their first period at the medical specialities (rotation A), they were more experienced and able to spend more time on self-directed consultations (rotation B). Even though less clear, the same pattern was observed for rotations C and D. As the time spent on observing doctors declined, the time spent on self-directed consultations increased.

Considering the total time spent on the predefined clerkship activities, the findings show that students who were in their first clinical rotation spent relatively more time on the activities. This may indicate that the student's workload satisfaction is not only their main transition difficulty but that these students also spent relatively more hours in hospital. It seems that this extra time is spent for a large part on clinical meetings. Since this activity did not reveal a positive relationship with students' perceptions of the clinical learning environment, it is doubtful whether the extra time the students spend during their first rotation in hospital positively stimulated their learning process.

Figure 1 Mean time (minutes) of total time spent in hospital for two weeks by clerkship rotation



**Methodological considerations**

Student self-reports were used to determine the amount of time students spent on clerkship activities. The use of self-reports may have led to over or underestimation of the time students spent on specific activities. In constructing the diary used to record student time allocations we could have considered other activities or extended the diary. Students probably spent time on activities which could not be included in the diary. Because the activities are not completely mutually exclusive, students may also have experienced difficulties in assigning time to specific activities.

The relationship between each activity and the students' perceptions of the clinical learning environment was estimated by correlation analyses. Since partial correlations were executed, the individual relationships could be determined while controlling for the effects of the other time measures. However, we were not able to determine the optimal proportion of time spent on the activities related to the most positive perceptions of the quality of the clinical learning environment.

The data showed high variability in the time the students spent on the activities between different days. Since we asked students to fill in the Postgraduate Hospital Educational Environment Questionnaire once, it was not possible to analyse the relationship between the time allocations of one day and the students' perceived learning environment quality for that particular day. Furthermore, since anonymity was guaranteed it was impossible to link the students' time allocations to their clinical performance scores. Therefore, we could not estimate the relationship between time allocations and learning outcomes.

### **Implications and further research**

It proved very useful to know how medical students at our university following a specific clerkship rotation spend their time in the hospital. First, we can use the students' general timetables to better prepare students for their clinical training. We can advise students on how they should try to organize their clerkship time and recommend that they spend sufficient time on patient-related activities. Students starting their first clerkship rotations would be particularly likely to benefit from this information. This information can also be used to involve medical educators at the clinical workplace in the students' learning processes. They should investigate whether the students in their department or hospital spend their time differently than students in other departments or hospitals and whether changes should be made. Furthermore, students' clerkship assignments can be adapted in order to have students spend sufficient time on clerkship activities related to a high quality clinical learning environment.

The data presented on the students' time allocation did not include student characteristics. If we consider student gender, it is notable that women spent around half an hour per day more in hospital than men (8.0 hour against 7.5 hour). This time is mostly spent observing doctors. It seems reasonable that other characteristics, such as student competence levels, stress and learning strategies, will also relate to how students spend time in hospital. Therefore, these variables should be incorporated in future research on the perceived quality of the clinical learning environment.

The digital pen, as discussed in Chapter 6, may be a useful instrument for producing more reliable measures of student self-reported data. This device is able to file the time between different pen strokes in its memory. By keeping a diary in which students mark an activity when they start it, students will not have to think back at the end of the day and estimate the time they spent on the different activities. Existing software permits the time between these different marks to be calculated later. In future research we may use this, or other technical devices such as a Personal Digital Assistant (PDA), to make it easier for students to keep a diary.

## **INSTRUCTIVE FEEDBACK**

Two studies of feedback were presented in the third part of this dissertation. Previous studies already emphasized the importance of instructive feedback.<sup>15-17</sup> The research findings presented in Chapter 4 also showed the important role played by clinical staff. Chapter 4 showed that the time students spend on observing doctors was positively related to the perceived quality of their clinical learning environment. It was also found that the time students spend on directly supervised activities and the students' perceptions of their learning environment were positively related. However, it was remarkable that the correlation was not stronger. As was put forward in Chapter 4, an explanation may be found in the instructiveness of the feedback provided during the supervised activities. The supervisor's role, observation of behaviour and the student's active

participation were claimed to be important factors in the instructiveness of feedback.<sup>15,18-20</sup> In Chapter 5 the aim was to find empirical evidence for these expectations and to analyse the influence of the student's gender and clerkship experience on the perceived instructiveness of feedback.

Checklists are usually used to assess students' clinical skills performance. Checklist data can be used to provide a student with feedback and faculty can use these data for quality assurance purposes. In the sixth chapter the digital pen was introduced. This device transmits an examiner's handwritten notes to a database and aims to provide both students and faculty with suitable feedback. The aim was to describe our experiences with the digital pen, analyse examiner satisfaction and explore the utility of the generated checklist data for quality assurance purposes.

### **Findings and discussion**

The expected relationships between the supervisor, observation, student initiative and the perceived instructiveness of feedback were partly confirmed by the data. It was found that students perceived feedback to be more instructive when it was based on behaviour that was observed by the staff member who provided the feedback. Interesting interaction results were determined concerning students' gender and the supervisor and between students' gender and the initiator of the feedback moment. In general, women perceived their feedback to be more instructive than men. This difference was greatest when feedback was provided by nursing and paramedical staff or initiated by the supervisor (Figure 2 and 3). It was striking that male students perceived feedback to be more instructive when it was provided by specialists or residents rather than nursing and paramedical staff. For women the difference in perceived instructiveness between feedback from specialists, residents and nursing and paramedical staff was nil. Also for the variable initiator the difference in perceived instructiveness between feedback initiated by the supervisor, the student or based on a joint initiative is minimal for female students. Men perceived feedback initiated by the supervisor clearly as least instructive.



Figure 2 Perceived instructiveness of feedback moment. Interaction between student gender and supervisor

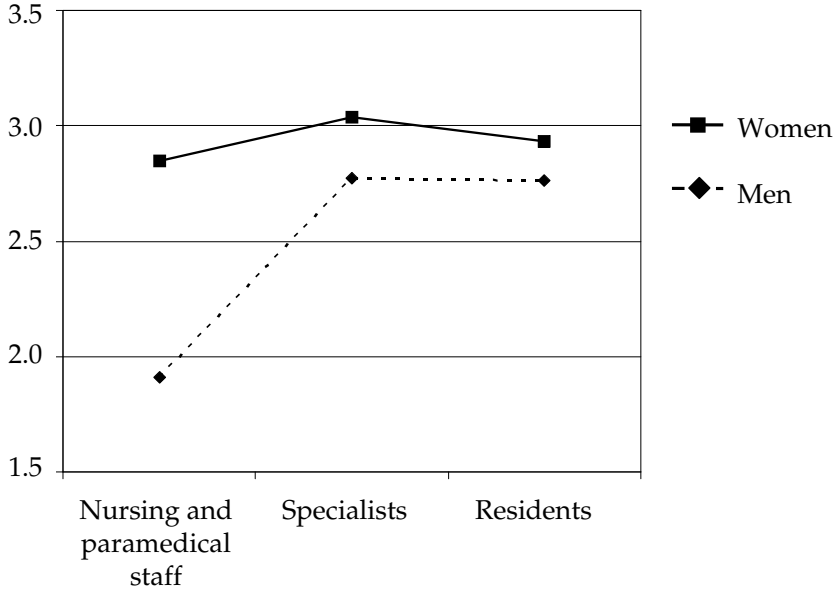
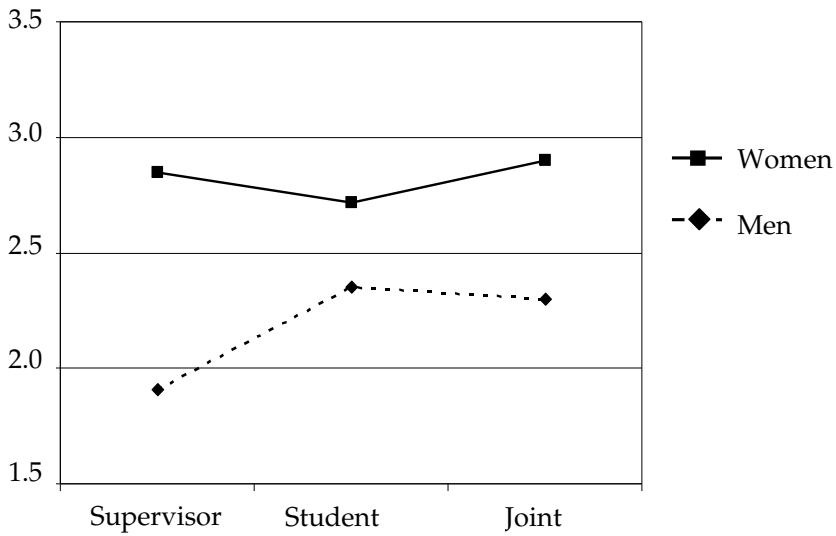


Figure 3 Perceived instructiveness of feedback moment. Interaction between student gender and initiator



The results in Chapter 6 indicated that the digital pen is a practicable device for transmitting written checklist data. The device is able to store written information in a database and to send completed checklists to the students' mailboxes. The examiners were satisfied with the digital pen, and the descriptive data were useful for quality assurance purposes. The implementation of the digital pen was a long process in which medical educationalists and computer programmers had to cooperate closely. This resulted in a large database (with infinite capacity) containing useful data for quality assurance purposes and research. However, particular attention should be paid to the anonymity of data. It is of crucial importance that the completed checklists sent to the students' mailboxes are addressed to the correct e-mail addresses so that students can only view their own checklists. The processing of information in the database is also vulnerable with respect to the anonymity of the checklist data. To perform useful analyses, the data must be linked to the student and examiner over a longer period. However, if other people gain access to this database, concerns with respect to anonymous data processing increase.

### **Methodological considerations**

The students who participated in the study presented in Chapter 5 were asked to record their individual feedback moments over a period of two weeks. On the one hand, this relatively long period improved the reliability of the gathered data. On the other hand, it may have caused some bias. It is possible that the students became bored with recording their feedback moments and forgot to record some of them near the end of the second week. Furthermore, it is questionable whether the students perceived all information provided by clinical staff as individual feedback on their behaviour. We made a selection in the independent variables which were analysed. Naturally, the influence of other variables on the instructiveness of feedback would also be interesting to determine. The content of the feedback provided and the gender of the supervisor would be of specific interest.

The study of the digital pen was explorative. Because the digital pen was a relatively recent innovation in practice at the time the study was conducted, we were not able to perform any advanced statistics. Since then, the database has been filled with more checklist data and more sophisticated statistics can be obtained. Moreover, partly due to this reason, the scores on the examiners' satisfaction with the digital pen were only based on 15 examiners.

### **Implications and further research**

The results showed no difference in the perceived instructiveness of the feedback provided by residents or specialists. This implies that residents can also be involved in the training of clerkship students. It was also found that feedback by nursing and paramedical staff was less valued by male students. However, since students should learn to collaborate with different professional groups working in the hospital, this is not a reason to reduce feedback by nursing and paramedical staff.

Future research should determine whether the content of feedback and the supervisor interact in their influence on the perceived instructiveness. Furthermore, the possible interaction between the students' gender and the gender of the medical staff member providing feedback should be analysed further. Our finding that men perceived feedback from nursing and paramedical staff to be less instructive may well be caused by an interaction effect between the student's gender and the supervisor's gender. In this study we only asked students to complete a questionnaire. However, the opinion of clinical staff about the feedback they provided to students would also be helpful in improving the feedback process during clerkships. Future research should examine whether the information clinical staff provide as feedback to students is also perceived as feedback by the students. The results of the study concerned the perceived instructiveness of feedback. It does not automatically mean that students have learnt more from the feedback they perceived as more instructive. In future research the relationship between the perceived instructiveness of feedback and the students' learning outcomes should be examined.

In the near future, the use of the digital pen should be extended so that not only the assessment of clinical skills, but also other oral examinations can be conducted using the digital pen. Every five weeks the database receives around 750 checklists. Standardized procedures should be developed to statistically handle the data gathered. For example, examiners should receive automatic feedback on their rating skills, test developers should be informed about results and procedures should be developed to monitor the quality of training programmes.

## REFERENCES

- 1 Genn JM. Curriculum, environment, climate, quality and change in medical education – a unifying perspective (Part 1). *Med Teach* 2001;**23**:337–44.
- 2 Genn JM. Curriculum, environment, climate, quality and change in medical education – a unifying perspective (Part 2). *Med Teach* 2001;**23**:445–54.
- 3 Lloyd C, Gartrell NK. Psychiatric symptoms in medical students. *Compr Psychiatr* 1984;**6**:552–65.
- 4 Guthrie E, Black D, Bagalkote H, Shaw C, Campbell M, Creed F. Psychological stress and burnout in medical students: a five-year prospective longitudinal study. *J R Soc Med* 1998;**91**: 237–43.
- 5 Niemi PM, Vainiomäki PT. Medical students' distress – quality, continuity and gender differences during a six-year medical programme. *Med Teach* 2006;**28**:136–41.
- 6 Ross S, Cleland J, Macleod MJ. Stress, debt and undergraduate medical student performance. *Med Educ* 2006;**40**:584–9.
- 7 Aktekin M, Karaman T, Senol YY, Erdem S, Erengin H, Akaydin M. Anxiety, depression and stressful life events among medical students: a prospective study in Antalya, Turkey. *Med Educ* 2001;**35**:12–7.
- 8 Small PA, Suter E. Transition in basis medical science teaching. In: GR Norman, CPM van der Vleuten, DI Newble, editors. *International Handbook of Research in Medical Education*. Dordrecht: Kluwer Academic Publishers 2002;337–63.

- 9 Rabinowitz HK, Babbott D, Bastacky S et al. Innovative approaches to educating medical students for practice in a changing health care environment: the National UME-21 project. *Acad Med* 2001;**76**:587–97.
- 10 van Dalen J, Kerkhofs E, van Knippenberg-van den Berg BW, van den Hout HA, Scherpbier AJJA, van der Vleuten CPM. Longitudinal and concentrated communication skills programmes: two Dutch medical schools compared. *Adv Health Sci Educ* 2002;**7**:29–40.
- 11 Mainhard MT, van den Hurk MM, van de Wiel MWJ, Crebolder HFJM, Scherpbier AJJA. Learning in a clinical education programme in primary care: the Maastricht Adoption Programme. *Med Educ* 2004;**38**:1236–43.
- 12 Jacobs JCG, Bolhuis S, Bulte JA, Laan R, Holdrinet RSG. Starting learning in medical practice: an evaluation of a new introductory clerkship. *Med Teach* 2005;**27**:408–14.
- 13 Peeraer G, Scherpbier AJJA, Remmen R, de Winter BY, Hendrickx K, van Petegem P, Weyler J, Bossaert L. Clinical skills training in a skills lab compared with skills training in internships: comparison of skills development curricula. *Educ Health (Abingdon)* 2007;**20**(3):125.
- 14 Boor K, Scheele F, van der Vleuten CPM, Teunissen PW, den Breejen EME, Scherpbier AJJA. How undergraduate clinical learning climates differ: a multi-method case study. *Med Educ* 2008;**42**:1029–36.
- 15 Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. *Med Educ* 2000;**34**:827–40.
- 16 Dolmans DHJM, Wolfhagen IHAP, Essed GGM, Scherpbier AJJA, van der Vleuten CPM. The impacts of supervision, patient mix, and numbers of students on the effectiveness of clinical rotations. *Acad Med* 2002;**77**:332–5.
- 17 Wimmers PF, Schmidt HG, Splinter TAW. Influence of clerkship experiences on clinical competence. *Med Educ* 2006;**40**:450–8.
- 18 Ende J. Feedback in clinical medical education. *JAMA* 1983;**250**:777–81.
- 19 Irby DM. Teaching and learning in ambulatory care settings: a thematic review of the literature. *Acad Med* 1995;**70**:898–931.
- 20 Sachdeva AJITK. Use of effective feedback to facilitate adult learning. *J Cancer Educ* 1996;**11**:106–18.