More observation, reflection and feedback for medical students through appropriate instruction and Video Fragment Rating.

Authors:
Alexander. H.J. Dierssen, Jan. J.A.M. Van Den Dungen, Jakob De Vries, Dirk P. Ter Meulen and Erik Heineman University of Groningen and University Medical Center Groningen, the Netherlands

Corresponding Author:
A.H.J. Dierssen, University Medical Center Groningen, Hanzeplein 1, 9713 GZ Groningen, The Netherlands. Tel. +31503611990; fax: +31503611745; e-mail: a.h.j.dierssen@umcg.nl

Abstract

Background: Lack of observations of medical students during their clinical clerkship is a problem because giving qualitative feedback is impossible without observation.

Aim: To increase the number of observations In Vivo and by using a video observation system. Secondly to strengthen the relationship between self-reflection and feedback.

Methods: Two instructions were developed: "How do I arrange an observation" and "In vivo observation at the outpatient clinic". Furthermore an intervention was developed concerning the use of a video observation system: Video Fragment Rating (VFR). Descriptive analysis of user satisfaction and number of observations was performed.

Results:. Procedural instructions slightly help to increase the number of In Vivo observations in the department and the outpatient clinic. The VFR system guarantees that interns are observed at least 1-2 times during their clinical clerkship. Interns appreciate In Vivo observation almost the same as VFR. Staff appreciates VFR significantly higher than In Vivo observation.

Conclusion: An integrated approach to observation, reflection and feedback in the clinical phase is effective and leads to an increase in the number of observations, both In Vivo and using the VFR system.

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Introduction

Evaluations in the first year of the Master's phase of the medical curriculum in Groningen revealed that for approx. 30% of the students insufficient observations form the basis of the assessments of the history-taking and the physical examination. This percentage is reflected in the international literature (Fromme et al. 2009; Pulito et al. 2006; Kogan et al. 2009).

This lack of observation is a problem, because giving qualitative feedback, one of the most valuable educationalist interventions (Hattie et al. 2007), is not possible without observation. The consequence is that interns are frequently assessed based on informal contact instead of observed concrete behaviour. In addition, recent research shows that, when compared with quantitative assessment, the educative return on properly given qualitative feedback is greater (Quantrill et al. 2012; Miller & Archer 2010).

Ideally, the feedback given is effective, sound, safe and also based on personal reflections of the student (Van de Ridder et al. 2008).

The lack of observations is attributable to the increased working pressure on the assessing doctors, an increase in the number of interns and the priorities that doctors give to patient care above education. For students, the lack of planning and reluctance to ask for observation are negative factors.

Other factors include insufficient assessment competences on the part of supervisors, students avoiding stress and a presumed lack of validation of assessments (Fromme et al. 2009).

Furthermore, a study of Dutch interns revealed that 28% are dissatisfied with how clinical clerkships are assessed. The reasons for this include too little observation, no constructive feedback and discrepancies experienced between performance and assessment (Buiten et al. 2010).

In the meantime, international assessment requirements are being tightened (Liason Committee on Medical Education 2008) and the view that a reliable final assessment must be based on several data points and ample information has gained ground (Pelgrim et al. 2011; Van der Vleuten et al. 2012). In other words, a number of observations by various observers in various clinical settings are a necessary condition for good medical education.

How can the number of observations be increased, while at the same time strengthening the relationship between self-reflection and the feedback based on it? Moreover, this should not lead to greater pressure on the relationship between patient care and education.

Various solutions can be found for this in the literature.

A recent review showed that video observation during the clinical stage of student performance is a strong and effective tool for learning (Hammoud et al. 2012; Sargeant 2012).

A simple and practical observation method for the outpatients' clinic which can also save time was described by Evans (2010). The key to this approach is the simultaneous processing of the medical details by the doctor, while the intern conducts the consultation.

Fehrenchick et al. (2010) is in favour of a combination of the use of an electronic checklist and giving an assessment incentive, while Russell and Ng (2009) emphatically plead for the development of an observation culture. Kogan et al. (2009) and Cook et al. (2009) are also in favour of this, and want to achieve it via observation training for assessors.

Lane and Gottlieb (2000), finally, designed a 'clinical skills teaching model' for busy clinical practice that saves both time and costs.

To the aspects of time and costs mentioned here, we add as a condition that any method chosen for the users must be easy to apply. The 'human dimension' must be a point of departure for action and the technology (in this case video) a means of achieving a stipulated objective.

Finally, a change in culture can, in our opinion, only be realised if the desired end result is focused on in various ways and regularly over a prolonged period.

Based on the above considerations, we formulated the following primary objective:

With adequate instruction regarding the procedural side of observation, optimization of in vivo observation and the use of a video recording system, the number of observations can be increased,

reducing the time required for observation. The secondary objective concerned determining the appreciation for the chosen intervention.

Methods

We developed 2 instructions (A and B) to prepare for observation and 1 intervention.

- Instruction A for interns concerned a video production called: How do I arrange an observation?

- Instruction B for supervisors was called: In vivo observation at the outpatients' clinic.

- The intervention for interns and supervisors concerned the use of a video observation system: 'Video Fragment Rating'.

Instruction A: How do I arrange an observation?

At the start of the clerkship, a video (approximately 8-minutes) is shown to the interns. This video humorously focuses on the pitfalls associated with organizing an observation and offers solutions.

The learning goals in this video are:

1. Learn actively and take the initiative to organize an observation.

In her PhD thesis, *Student learning behaviours and clerkship outcomes'* Van Lohuizen (2011, chapter 7) showed that independently acquiring knowledge and taking initiative (active learning behaviour) in clinical practice leads to higher educational returns. The examples in this video are in line with this recommendation.

2. List agreements made for an observation with the ward doctor and/or associate specialist.

This is a part of a self-regulation process known to reduce stress. (Van Lohuizen 2011)

This promotes greater awareness when dealing with each other as well as the joint goal.

3. Use the VFR system.

Organizing a video recording of a consultation and working with this system are also forms of self-regulation. See below, intervention (I)

Instruction B: In vivo observation at the outpatients' clinic

Evans (2010) described an observation method at the outpatients' clinic where an intern conducts the consultation with a new patient, the supervisor observes the intern and at the same time documents medical details. By scheduling old and new patients well and efficiently distributing work between intern and doctor, Evans believes it is possible to work time-neutrally. For application at the outpatients' clinic of the Surgery Department of the UMCG, a variation of the method was set out in a 6-step table and an instruction video of 2 minutes was made.

This video, the guidelines and the publication by Evans were discussed with the supervisors. The three items were also made available in a course in the electronic learning environment Blackboard.

Guidelines:

1. Doctor and intern discuss a new patient beforehand.	*The intern prepares the evening before.*
2. The intern calls the patient in, introduces him-/herself and the doctor. The latter sits behind the PC with the medical file.	*The patient immediately focuses on the intern.*
3. The intern takes the medical history the doctor takes notes for the medical file and gives guidance where necessary.	*In this context, the level of the intern must match the complexity of the patient.*
4. The intern performs the physical examination, the doctor observes and clarifies.	*Learning goals are gone over beforehand.*
5. The intern and the doctor discuss the policy with the patient.	*The participation of the intern depends on his/her level.*
6. Afterwards, reflection and feedback.	*Point of departure: simplified Pendleton rules. The intern names 2 good points and 2 points for improvement, whereupon the doctor gives feedback.*

Intervention: VFR system

With the help of an external software company, a video application, the VFR system*), was developed in 2011. Via the hospital network, time and place-independent video fragments of a recorded consultation can be viewed and marked with reflections by students and feedback from supervisors.

User instructions for the system are simple; it is extremely user-friendly and also the video camera is very easy to operate.

After the end of the consultation, the intern can mark important points of interest (observations made on reflection) by placing marks ('drops') at points on the time line on the recording. This can be done anywhere in the hospital. For each consultation part, the guideline is to mark 2 positive points and 2 improvement points using green and red drops. (Figure 1)

Using a mail function integrated in the system, the intern can invite one or more supervisors to give feedback on the reflections. If desired, the feedback can also be given verbally, or as a combination of non-verbal and verbal feedback.

To avoid reliability problems in practical assessments, the formative and summative roles of an assessor must be split as much as possible (Van der Vleuten et al. 2000). In the architecture of the system, this is taken into account by not providing any possibility for quantitative assessment.

The greatest possible attention is paid to the privacy of the patient and the intern. The privacy policy has been tested in close consultation with the Legal Affairs Department of the hospital.

Based on strict security requirements, the system is designed in such a way that only the intern and the invited supervisor are able to view a video recording made by the intern. No-one else has access to these images. Logs from the system, such as reflections and feedback, are saved as text files and stored separately from the video images and they can, if desired, be imported into an assessment system such as a portfolio.

The patient can give separate permission for the history-taking interview and the physical examination. The video recording is automatically destroyed after 6 weeks.

Results

Instruction A: How do I arrange an observation?

After the Surgery clerkship block, all the interns (n=144) were asked seven evaluation questions by mail in the period June to October 2011.

Because the curriculum was started by different students at different times, the composition of the cohorts in this period was 76% more experienced interns who had already followed 2 or 3 blocks.

The most important conclusions were the following:

The response to the questionnaires was 49% (n=70).

96% (67) stated that it was clear how to effectively arrange an observation.

During the clerkship, 30% of the interns (21) used one or more of the suggestions. This did not include working with the VFR system, which was compulsory. Of the 70% (49) who did not, 64% (31) indicated that observation and feedback were already well arranged at the clerkship location. 16% (11) indicated that they had not been or had only once been observed during the clerkship. Of the observers, 40% (69) were associate specialists/surgeons and 29% (49) ward doctors.

Instruction B: In vivo observation at the outpatients' clinic

Evaluations of associate specialists of the Department of Surgery of the UMCG showed that our suggested variation of the 'Evans' observation method was still insufficiently known there and was also not suitable for every type of patient. In particular, with complex patients, according to the supervisors, most 4th-year interns have insufficient experience and competences and they do not allow them to perform any tasks during the outpatients' clinic consultation. Usually, the intern observes the supervisor and the patient.

Nevertheless, there has been a slight increase in the number of 'Evans' observations. In the first and second block 2 interns, in the third block 3 interns and in the fourth block 6 interns were observed 1 or 2 times in line with the method described.

Number of observations in vivo, in the department and at the outpatients' clinic:

Over a shorter or longer period, most students were observed at least once during a standard consultation. The number of in vivo observations of a consultation was per student (n=71) on average for history-taking: 2.3, for physical examination: 2.5 and for policy: 1.8 .

The number of interns that were observed: nil, one, two or three times is shown in Figure 2.

In 10% of the internships interns are not observed in vivo during history and physical examination. In 33% of the internships in vivo observation during the discussion of the policy does not take place.

To be observed once, both in vivo as well as with VFR, is found in 18 - 28% of the interns. 55% of the interns were twice observed using VFR. The number of interns that were observed in vivo 3 times and more was between 35 and 42% per part. The number of VFR observations decreased after 2 times again. More than 3 times interns are mainly observed in vivo and for the components history, PE and policy more or less equal.

VFR guarantees that an intern is at least 1-2 times observed.

The average score (Figure 3) that interns (n=71) gave for In Vivo observation, self-reflection and feedback was 7.59

The average score of final assessors (n=26) for In Vivo observation, self-reflection and feedback was 7.3

Of the final assessors, 43% (n=9) believed that time could be saved with the local

variation of the 'Evans' observation method. The remaining end observers had doubts.

Intervention: use of the VFR system

All students made at least one compulsory video recording of an admission consultation (history-taking and physical examination) on the ward. In this type of consultation, policy holds a modest position. During the measurement period, the number of recorded observations using the VFR system was per intern (n=71) on average 1.5 with a range of 1-6 observations.

The average recording time of a consultation was 29 minutes with a range of 7 - 47 minutes.

The average score that interns (n=71) gave for observation, self-reflection and feedback using the VFR system was 7.54.

(When an intern viewed the recording together with a supervisor, the score of the intern increased to 7.8.)

The average score of the final assessors (n=26) for observation, self-reflection and feedback using the VFR system was 7.8. (Figure 3)

Discussion

Ideally, sufficient observations are the prerequisite for a reliable practical assessment.

A practical assessment though, is often based on the judgement of others (ward doctor, etc.) or on general interaction factors. This may be a reason for the fact that in general there is little differentiation in the assessment scores.

The intervention described in this article, incidentally, did not lead to deviations in the assessment figures for the clinical clerkship in the Surgery block in comparison with the period before the interventions. The average assessment of the students before the intervention was 7.79 (N=191), and after the intervention 7.77 (N=275). In the Department of Surgery of the UMCG, this was 7.7 (N=76) before and 7.69 (N=100) after the intervention.

It thus appears that the VFR system is used by assessors as a qualitative feedback system, as was the intention. Because the interns can only place positive (green drops) and critical (red drops) reflections and the supervisors can respond to them or themselves place 'neutrally-coloured' feedback drops at other points, the formative character of the system is underlined. To guarantee ease of use, to retain the formative character and for reasons of cost, we think it is important that the VFR system is not used for summative purposes.

Electronic portfolio systems are better equipped for this.

Clinical clerkships can vary somewhat as regards difficulty and diversity and despite good pre-clinical training the difference in level between new interns is often large.

It is difficult to pragmatically express this difference in level with the current assessment systems.

In addition, according to Quantrill and Tun (2012) and Miller and Archer (2010) there is no evidence that assessment systems like MiniCEX and DOPS actually lead to an improvement in performance. According to these authors, the most important aim of a clinical clerkship should be to at least achieve *subjective* experienced performance improvement in the workplace.

How could this be realised?

According to Van Merriënboer and Sweller (2010), purposeful practice and learning in the workplace is the key and an essential condition here. By having professionals in training reflect on questions such as, 'Can this be learnt easily?', 'Can you always benefit from this?', 'Is this the best approach?' as well as using the results of this reflection in the next training process, it is effective. Van Merriënboer calls these instrumental questions 'judgements of learning' or 'meta-cognitive prompts'.

How can the VFR system contribute to this?

More observation is often at odds with patient care, as we know. Despite this, on average 7-14 assessments are needed to come to a reliable final conclusion (Schuwirth & Van der Vleuten 2005). It is evident that observations from interns must limit themselves to a few moments or fragments to be practically realisable. Ten Cate et al. (2010) also advocates this, even though he says this is counterintuitive.

Another reason to limit the number of reflection points is the danger of cognitive overload. Brand et al. (2011) stated that the longer you observe, the more difficult it becomes to set priorities for the discussion afterwards. They recommend not observing for longer than 5 minutes. In combination with video recording, they limit the number of fragments to be selected to two: one good fragment and one fragment where improvements can be made.

The guideline used by us to mark 2 positive and 2 improvement points takes a middle position. If students and assessors keep to this guideline, saving time appears possible. Half of the 14 supervisors questioned in September 2011 thought the time-saving was feasible.

In a limited study performed in 2009 in which three history-taking sessions recorded on video were assessed by various supervisors, it was shown that the assessment over the entire recorded session did not differ from that of four fragments selected by the intern, comprising the two most positive and two weakest fragments, as well as the associated reflections (Dierssen et al. 2010).

Various studies say that short fragments, 'thin slices' of approximately 1 minute, have predictive value for 'these rapport scores, as well as concurrent validity to full-session communication in regard to both content categories and global affect.' (Roter et al. 2011; Hall et al. 2009; Ambadi 2010; Rosenblum et al. 1994; Pulito et al. 2007)

A second educational development that lends itself to gaining experience within the VFR system is the application of 'external performance standards'. Hawkins (2012) and Sargeant (2012) point to the strong positive correlation that exists between:

a. offering benchmarks of competence on video

b. self-reflection and self-assessment of the competences recorded on video, and

c. the expert assessment scores.

In the first place, these benchmarks can be useful for inexperienced students. They therefore support the age-old motto: 'If you don't know where you are going, how can you know when you get there?'

Such benchmarks can be easily included in the VFR system. A short explanation of the benchmark cue points can be given using the time line and the marking function.

The above-mentioned developments and the fact that reflection must, according to Van Merrienboer, lead to the planning of future action, in this case improvement objectives (the meta-cognitive prompts), can lead to a working method with the VFR system that looks as follows:

1. Interns formulate their learning objectives for conducting a consultation at the beginning of a clinical clerkship, using a benchmark.

2. At the beginning of the clerkship, they make a video recording of a consultation.

3. During the debriefing relating to this, they mark 2 reflections with improvement objectives and, if possible, 2 reflections with realised learning objectives on a time line.

4. In the last part of the clerkship they hold a second consultation, after which point 3 is repeated.

5. They collect cognitive feedback on the quality of the task execution from the observers invited using the system.

6. Based on the collected feedback, the interns assess whether the learning objectives have been approached or achieved.

7. If desired, reflections, feedback and final conclusion can be exported from the VFR system to an electronic portfolio.

Whether the willingness of patients to cooperate in video recordings within the clinic will always remain large cannot be predicted; some concern in this regard would seem justified. It is clear that that when asking for informed consent, a distinction must be made between education, research and patient care.

For research purposes, it is often not possible to estimate for how long videos are kept. For videos made for the purpose of patient care, there is a retention obligation. In the educational setting described by us, there is an empirically chosen moment for destruction. However, generally applicable regulations for this in health care are few and far between (Henken et al. 2012).

The increasing number of video cameras appearing in public life may negatively influence the answer to the request for consent.

Such aspects must therefore be taken into account when counselling students, patients and parents of young children.

Video recording of the consultation by interns requires good organization. The large number of interns makes low-threshold support a condition. Training staff could, in particular, play an important role regarding instruction and socio-psychological counselling regarding obtaining informed consent. However low the threshold is for the hardware and the user-friendliness of the software, a good accessible IT backoffice is without doubt important.

The VFR system will be further developed in close cooperation with the IT Department and the Security Officers of the UMCG. The expectation is that the VFR system will be developed as a standard application for the whole hospital. Optimum security is a *conditio sine qua non* and NEN certification of the VFR system is the tangible goal.

Conclusion

The VFR system has in a short time earned a permanent place in the Department of Surgery at the UMCG. The simplicity and user-friendliness of the system have borne fruit, patients enthusiastically cooperate with the envisaged learning objectives; very few patients refuse to give informed consent.

An integrated approach to observation, reflection and feedback in the clinical phase is effective and leads to an increase in the number of observations, both In Vivo and using the VFR system. As a consequence of this, the number of observations in the surgical clinic of the UMCG have increased by nearly 100% since September 2011.

There was no difference in appreciation by interns for In Vivo observation in comparison with observation using the VFR system. The methods were experienced as complementary.

In addition, discussing a video recording with a supervisor was highly valued. In this case, the benefits of both methods are expressed even better.

Supervisors score Video observation higher than In Vivo observation and also more favourably than interns. A possible explanation for this is their lack of opportunities to compare, as some of them rarely observe in vivo.

With structural attention for the procedural side of observation, an efficient In Vivo procedure and the VFR system, the extra time required for observation can possibly be further reduced. More research into the reliability of the assessment based on short fragments is therefore needed.

In addition, new insights and developments in medical practical training can support this and increase the educative application possibilities of the VFR system.

The effects of working with the meta-cognitive prompts (judgements of learning) during reflection and offering practical examples of conducting consultations (benchmarks) must be further researched.

*) http://videofragmentrating.com

Practice points

- An integrated approach of observation, reflection and feedback is successful

- Efficient observation of clinical performance is a matter of proper instruction and organization

- In vivo observation and video observation are complementary

- Saving observing time appears possible when video-observation is restricted to 4 reflections

- The VFR system offers good opportunities to support the use of external performance standards and judgments of learning

Notes on contributors

ALEXANDER H.J. DIERSSEN is education coordinator and - developer, Department of Surgery, University Medical Center Groningen and University of Groningen

JAN J.A.M. VAN DEN DUNGEN, MD, PhD, is head of the Department of Vascular Surgery, University Medical Center Groningen and University of Groningen; member of the board of examiners Faculty of Medical Sciences University of Groningen; member of the training committee of the Dutch Society for Vascular Surgery

JAKOB DE VRIES, MD, PhD, is consultant surgical oncologist and chair education committee, Department of Surgery, University Medical Center Groningen and University of Groningen; director of the WHO collaborating center for cancer education

DIRK P. TER MEULEN is a master student of medicine, University of Groningen and student-assistant education development, Department of Surgery, University Medical Center Groningen

ERIK HEINEMAN, MD, PhD, is professor of surgery and head of the Department of Surgery, University Medical Center Groningen and University of Groningen; coordinator of the North Eastern School of Surgery, The Netherlands.

References

Ambadi N. 2010. The Perils of Pondering: Intuition and Thin Slice Judgments. Psychol Inq 21:271-278.

Brand P, Boendermaker P, Venekamp R. 2011. Videoregistratie van activiteiten van de aios. Klinisch onderwijs en opleiden in de praktijk. 2nd edn. Houten: Prelum Uitgevers BV, pp 87-91.

Buiten M, Walhout R, Heeren M. 2010. Beoordeling van house officers in de kliniek: nog altijd ruimte ter verbetering. TMO 29:229-236.

Cook DA, Dupras DM, Beckman TJ, Thomas KG, Pankratz VS. 2008. Effect of Rater Training on Reliability and Accuracy of Mini-CEX Scores: A Randomized, Controlled Trial. J Gen Intern Med 24:74-79.

Dierssen AHJ, De Groot M, De Vries J. 2010. Learning in the clinical environment: the role of video fragment rating in observation and feedback. Paper edn. Enschede: European Association of Cancer Education.

Evans SJ. 2010. Effective direct student observation strategies in neurology. Med Educ 44:500-501.

Ferenschick FS, Foreback J, Towfiq B, Kavanaugh K, Solomon D, Mohmand A. 2010. The implementation of a mobile problem-specific electronic CEX for assessing directly observed student-patient encounters. Med Educ Online 15: 4276 - DOI: 10.3402/meo.v15i0.4276

Fromme HB, Karani R, Downing SM. 2009. Direct Observation in Medical Education: Review of the Literature and Evidence for Validity. Mt Sinai J Med 76: 365-371.

Hall JA, Roter DL, Blanch DC, Frankel RM. 2009. Observer-rated rapport in interactions between medical students and standardized patients. Patient Educ Couns 76: 323-327.

Hammoud MM, Morgan HK, Edwards ME, Lyon JA, White C. 2012. Is video review of patient encounters an effective tool for medical student learning? A review of the literature. Adv Med Educ Pract 3: 19-30.

Hattie J, Timperley H. 2007. The power of feedback. Rev Educ Res 77: 81-112.

Hawkins SC, Osborne A, Schofield SJ, Pournaras DJ, Chester JF. 2012. Improving the accuracy of self-assessment of practical clinical skills using video feedback – The importance of including benchmarks. Med Teach 34: 279-284.

Henken KR, Jansen FW, Klein J, Stassen LPS, Dankelman J, Van den Dobbelsteen JJ. 2012. Implications of the law on video recording in clinical practice. Surg Endosc: DOI 10.1007/s00464-012-2284-6

Kogan JR, Holmboe ES, Hauer KE. 2009. Tools for Direct Observation and Assessment of Clinical Skills of Medical Trainees; A Systematic Review. JAMA 302: 1316-1326.

Lane JL, Gottlieb RP. 2000. Structured clinical observations: a method to teach clinical skills with limited time and financial resources. Pediatrics 105: 973-977.

LCME and CACMS, 2008-last update, Guide to the Institutional Self-Study 2009-2010 for programs of medical education leading to the M.D. degree [Homepage of Liaison Committee on Medical Education], [Online]. Available: http://www.lcme.org/selfstudyguide0910.pdf.

Miller A, Archer J. 2010. Impact of workplace based assessment on doctors' education and performance: a systematic review. BMJ 341: c5064

Pelgrim EAM, Kramer AWM, Mokkink HGA, Van den Elsen L, Grol RPTM, Van der Vleuten CPM. 2011. In-training assessment using direct observation of single-patient encounters: a literature review. Adv Health Sci Educ Theory Pract 16: 131-142.

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Pulito AR, Donnelly MB, Plymale M, Mentzer Jr. RM. 2006. What Do Faculty Observe of Medical Students' Clinical Performance? Teach Learn Med 18: 99-104.

Pulito AR, Donnelly MB, Plymale M. 2007. Factors in faculty evaluation of medical students' performance. Med Educ 41: 667-675.

Quantrill SJ, Tun JK. 2012. Workplace-based assessment as an educational tool. Guide supplement 31.5 – Viewpoint. Med Teach 34: 417-418.

Rosenblum ND, Wetzel M, Platt O, Daniels S, Crawford J, Rosenthal R. 1994. Predicting Medical Student Success in a Clinical Clerkship by Score Students' Nonverbal Behavior. Arch Pediatr Adolesc Med 148: 213-219.

Roter DL, Hall JA, Blanch-Hartigan D, Larson S, Frankel RM. 2011. Slicing it thin: new methods for brief sampling analysis using RIAS-coded medical dialogue. Patient Educ Couns 82: 410-419.

Russell G, Ng A. 2009. Taking time to watch; observation and learning in family practice. Can Fam Physician 55: 948-950.

Sargeant J. 2012. How external performance standards inform self-assessment. Med Teach 34: 267-268.

Schuwirth LWT, Van der Vleuten CPM. 2005. Assessment of medical competence in clinical education. Ned Tijdschr Geneeskd 149: 2752-2755.

Ten Cate OTJ, Snell L, Carraccio C. 2010. Medical competence: the interplay between individual ability and the health care environment. Med Teach 32: 669-675.

Van de Ridder JMM, Stokking KM, McGaghie WC, Ten Cate OTJ. 2008. What is feedback in clinical education? Med Educ 42: 189-197

Van der Vleuten CPM, Scherpbier AJJA, Dolmans DHJM, Schuwirth LWT, Verwijnen GM, Wolfhagen HAP. 2000. Clerkship assessment assessed. Med Teach 22: 592-600.

Van der Vleuten CPM, Schuwirth LWT, Driessen EW, Dijkstra J, Tigelaar D, Baartman LKJ, Van Tartwijk J. 2012. A model for programmatic assessment fit for purpose. Med Teach 34: 205-214.

Van Lohuizen MT. 2011. Student learning behaviours and clerkship outcomes, Thesis. University of Groningen, the Netherlands.

Van Merriënboer JJG, Sweller J. 2010. Cognitive load theory in health professional education: design principles and strategies. Med Educ 44: 85-93.

Figure 1

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Figure 2

Number of observations. N=71 students

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Figure 3