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BMJ Open Effectiveness of a supervisor training on quality of feedback to internal medicine residents: a controlled longitudinal multicentre study

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ABSTRACT

Objectives High-quality feedback on different dimensions of competence is important for resident learning. Supervisors may need additional training and information to fulfil this demanding task. This study aimed to evaluate whether a short and simple training improves the quality of feedback residents receive from their clinical supervisors in daily practice.

Design Longitudinal quasi-experimental controlled study with a pretest/post-test design. We collected multiple premeasurements and postmeasurements for each supervisor over 2 years. A repeated measurements ANOVA was performed on the data.

Setting Internal medicine departments of seven Dutch teaching hospitals.

Participants Internal medicine supervisors (n=181) and residents (n=192).

Intervention Half of the supervisors attended a short 2.5-hour training session during which they could practise giving feedback in a simulated setting using video fragments. Highly experienced internal medicine educators guided the group discussions about the feedback. The other half of the supervisors formed the control group and received no feedback training.

Outcome measures Residents rated the quality of supervisors' oral feedback with a previously validated questionnaire. Furthermore, the completeness of the supervisors' written feedback on evaluation forms was analysed.

Results The data showed a significant increase in the quality of feedback after the training $F(1, 87)=6.76$, $p=0.04$. This effect remained significant up to 6 months after the training session.

Conclusions A short training session in which supervisors practise giving feedback in a simulated setting increases the quality of their feedback. This is a promising outcome since it is a feasible approach to faculty development.

INTRODUCTION

In competency-based residency training, regular, high-quality feedback from supervisors on performance is of major importance for resident learning.¹ Frameworks such as the CanMEDS define desired learning outcomes in the form of competencies that

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The longitudinal design allowed us to measure effects up to 6 months after the faculty training, which increases the practical relevance of the study.
- ⇒ The study design did not allow us to unravel underlying mechanisms for what made the training effective and what may be redundant.
- ⇒ Two complementary outcome measures—the quality of feedback rated by residents and the completeness rated by the researchers—increased the study's validity.
- ⇒ The content and setup of the training are firmly rooted in seminal research on feedback in medical education.
- ⇒ Transferability of our results to other settings is probably high, as the training took place in authentic residency settings, where all internal medicine supervisors and residents of the seven teaching hospitals took part in this study.

residents need to develop.² To enable residents to acquire the desired competencies, supervisors need to address them in their feedback. Defining competencies, however, does not necessarily mean that supervisors know how to effectively incorporate them into feedback,^{3–5} training supervisors is, therefore, considered an essential component of the successful implementation of competency-based residency training.^{6,7} Many faculty development programmes have been developed for this purpose; however, these are often demanding and time-consuming on the part of busy clinical supervisors.^{8–11} We aimed for a more feasible approach to faculty development by addressing important aspects of effective feedback during a short training session.

The literature extensively describes various aspects that make feedback effective.^{12–13} Previous studies have shown that feedback in the clinical workplace is regularly too general

and not well balanced between the different competencies.³⁻⁵ Although residents consider narrative feedback helpful, they also express a need for more specific suggestions for improvement from their supervisors.¹⁴ Furthermore, they desire greater supervisor involvement in synthesising feedback comments and integrating them into their practice.¹⁵ Therefore, feedback training for clinical supervisors should focus on how they can help residents reflect on their performance regarding different competencies and define points for further improvement.

In literature, several studies have investigated the effects of faculty development on clinical supervisors' teaching skills. Multiple studies have shown that faculty development programmes positively impact supervisors' teaching skills.^{6 8-11 16-26} Unfortunately, these studies often rely on self-reported perceived effects or overall satisfaction of participants rather than actual teaching outcomes.^{6 8 16-24} Other study designs for evaluating faculty development are not controlled.^{18 20 25 26} The few studies we could find with rigorous designs and promising outcomes concerned intensive or longitudinal faculty development programmes that require a major time investment from the clinical supervisors.⁸⁻¹¹ Since clinical supervisors have expressed that they only find a short training acceptable and useful, these intensive programmes might not be feasible.^{27 28} Although there are some indications that a few hours of training already impacts the quality of supervisors' feedback, it remains unknown whether the effects last over a longer period.^{29 30}

To achieve best practices and improve the quality of clinical supervisors' feedback to residents, we developed a training session for supervisors on how to provide feedback on competencies, which requires minimal time investment on the part of the supervisors. We examined the effectiveness of this training session over time by comparing measures of the quality of verbal feedback and completeness of written feedback to residents between a trained group of supervisors and an untrained control group.

METHODS

Setting and subjects

This study was set out in the internal medicine departments of seven teaching hospitals affiliated with the University Medical Center Groningen. All participants were informed about the study, that participation was voluntary, and data would be analysed anonymously. All residents (n=192) and all their supervisors (n=181) agreed to participate in this study.

Internal medicine residency is a 6-year training programme in which rotations are distributed over different hospitals. During this study, residents received written feedback from multiple supervisors using common, clinical situation-specific evaluation forms. We designed these forms to foster high-quality feedback and included fields for writing down the positive

and improvement points concerning predetermined CanMEDS roles within specific situations.³¹ There were no preset moments for the evaluations; residents were encouraged to ask their supervisors for feedback at least 12 times per year. Both residents and supervisors could initiate a feedback moment. These feedback forms were an integral part of residents' regular portfolios. All supervisors received previous training in the basics of clinical supervision and workplace learning.

Supervisor training session

The training was a brief 2.5-hour session under the guidance of two internal medicine postgraduate educators who were highly experienced in providing feedback. We organised local training in each teaching hospital, with 8-12 supervisors in each session. The training drew on the professional experience of the trainers, recent literature about feedback,^{3-5 12-15} and a notion of the importance of reflection for residents' learning.³² During the training, we showed short video fragments of resident-patient interactions. The videos were specifically recorded for faculty training purposes with the written consent of the videotaped resident. Additionally, we selected fragments of the TV show *House M.D. for the training*. While watching the videos, supervisors had to choose a competency, or two, to focus their feedback on. The trainers asked supervisors to identify strengths as well as points for improvement for the resident with that competency in mind. Subsequently, they participated in role-playing exercises similar to the video fragment they had just seen. First, the trainers set an example by playing both roles, and then the supervisors took turns in giving feedback while the trainers played the resident role. After each role-play, trainers provided feedback and led a group discussion. The group discussed the feedback-giving process, feedback strategies, what went well, areas of improvement and other options the supervisor could have taken. Hence, the training was tailored to individual supervisors' needs.³³ Finally, we synthesised key learning points for the entire group. We have described the training in more detail in online supplemental appendix 1.

Study design

The study was a quasi-experimental, longitudinal, pre-post controlled trial. To investigate the effectiveness of the training session, supervisors were either assigned to the trained group receiving feedback training or to the control group receiving no training. In each of the seven hospitals, we organised a local training in consultation with the programme director. We based group allocation on supervisors' availability on the date of the training and supervisors' personal preference to participate in the training or not. Department heads invited all supervisors to register for the training. When half of the supervisors in a department had registered, enrolment for the training was closed, and the remaining supervisors were assigned to the control group. Trained supervisors were instructed not to discuss the content of their training with

their untrained colleagues nor to provide residents with information concerning their enrolment and participation in the feedback training.

Training effectiveness was measured in terms of quality and completeness of verbal and written feedback provided by the supervisors using premeasurements and postmeasurements. Data of all regular feedback moments were collected for 1 year prior to the training (premeasurements) up to 6 months after the training (postmeasurements). Therefore, the design of our study reflected routine daily practice and the way clinical supervision was organised in the internal medicine departments.

Measurements

Quality of feedback focused on verbal feedback and was measured by a questionnaire filled out by residents right after each regular feedback moment. We used an existing, reliable questionnaire (Cronbach's $\alpha=0.91$) developed and validated with university students from several disciplines.³⁴ The questionnaire consisted of 11 items that had to be rated on a Likert scale from 1 to 7 (total score range: 11–77). The items covered development, for example, 'Feedback helped me focus on areas I could improve'; encouragement, for example, 'The feedback provider acknowledged my good points or ideas'; and fairness, for example, 'The feedback provider has adequate knowledge of my work behaviour to rate my performance'. We slightly modified the questionnaire to suit our study population better and replaced 'students' with 'residents' and 'feedback providers' with 'supervisors'. The questionnaire we used is depicted in online supplemental appendix 2. The questionnaires were attached to the regular evaluation forms on which the supervisors had to write down their feedback. Shortly after receiving feedback from their supervisors, the residents filled out the questionnaire, tore it off the evaluation form, and sent it directly to the primary researcher (first author) without showing it to their supervisors.

Completeness of feedback was measured by analysing feedback written on regular evaluation forms. Feedback was rated as 'extensive', 'conform instruction' or 'limited'. 'Extensive' feedback contained positive and improvement points for at least two-thirds of the predetermined CanMEDS roles. Feedback 'conform instruction' comprised positive and improvement points for at least half of the CanMEDS roles assigned to a specific situation. 'Limited' feedback addressed either positive or improvement points or only one CanMEDS role. NR, JB and ROBG analysed the completeness of a subset of 25 random feedback forms for which Cohen's Kappa was calculated to ascertain interrater reliability ($K=0.89$). Since inter-rater reliability was almost perfect,³⁵ analysed the remaining feedback herself.

Data analysis

The quality of the supervisor's feedback to residents was first approached with the feedback form as the unit of analysis. The continuous longitudinal data were coded

into four time slots: T_0 before training, T_1 up to 2 months after, T_2 2–4 months after and T_3 4–6 months after the training session. T-tests were used to compare differences between the trained and control group for each time slot. Furthermore, we used Analysis of Variance (ANOVAs), controlled for hospital, to compare differences in the quality of feedback within the trained and control group over time.

Subsequently, the quality of feedback was analysed with the supervisor as the unit of analysis to evaluate a change in the quality of an individual supervisor's feedback over time. In contrast to our initial tests with feedback form as the unit of analysis, this approach corrected for differences in the number of times a supervisor provided feedback, as we used average scores for each supervisor per time slot. In order to have sufficient data points, the data were restructured into two time slots: before the training (T_0) and after the training ($T_{1,2,3}$). Differences in the quality of feedback between the trained and control group were analysed for each measurement moment using ANOVAs, controlled for hospital.

Completeness of the supervisor's feedback was also analysed with the supervisor as the unit of analysis, using the frequencies of a categorical outcome (limited, conform instruction and extensive feedback). Contrasts between the completeness of trained and untrained supervisors' feedback before (T_0) and after the training ($T_{1,2,3}$) were analysed using Bonferroni corrected ($\alpha=0.008$) χ^2 tests.

Patient involvement

No patients were involved in the design or instigation of this study.

RESULTS

We received 1189 evaluation forms, from which 1127 were used for analysis. Of the remaining 62 forms, 19 were excluded because the measurement moment (date) could not be determined, and 43 forms were excluded because either premeasurements or postmeasurements were missing from those supervisors.

In total, 1127 evaluation forms from 107 supervisors—56 in the trained and 51 in the control groups—were analysed. The number of measurement moments varied across supervisors, depending on how often they provided feedback. Data were normally distributed, with skewness and kurtosis between 1.5 and -1.

Quality of feedback

Table 1 shows that at the baseline (T_0), there were no differences in the quality of feedback between the control and the to-be-trained group. At T_1 , T_2 and T_3 , the quality of trained supervisors' feedback was statistically significantly higher than that of untrained supervisors.

We tested differences in the quality of feedback between the trained and control group with feedback form as the unit of analysis. ANOVAs revealed a significant increase in the quality of feedback in the trained group directly

Table 1 Quality of feedback in the control and trained group over time on with feedback form as the unit of analysis

Quality of feedback (range: 11–77)	Control group	Trained group	T-tests
T ₀ Mean (SD)	61.47 (8.88)	60.79 (8.25)	t(824)=1.13, p=0.62
T ₁ Mean (SD)	63.73 (8.63)	65.65 (5.79)*	t(46)=-9.20, p=0.36
T ₂ Mean (SD)	60.94 (8.62)	64.74 (7.53)*	t(91)=-2.23, p=0.03
T ₃ Mean (SD)	64.24 (9.31)	67.13 (6.50)*	t(85)=-1.70, p=0.06
ANOVA†	F (4,442) = 1.59, p=0.19	F (4,629) = 7.20, p=0.00	

*Post hoc Bonferroni tests with significant differences compared with T₀ (α=0.05).
†Controlled for hospital.
ANOVA, Analysis of Variance.

afterward up to 6 months after the training. In contrast, in the control group, the quality of feedback was not statistically higher at T_{1,2,3} (table 1).

Testing differences in the quality of feedback between the trained and control group with the supervisor as the unit of analysis, ANOVAs found no significant differences between the two groups at the baseline measure (T₀). A significant increase in the quality of feedback between the control (M=62.72, SD=7.52) and trained (M=66.14, SD=4.64) group of supervisors was found during the 6 months after the training F(1, 87)=6.76, p=0.04 (table 2).

Completeness of feedback

The completeness of supervisors' written feedback on evaluation forms is presented in table 3. Overall, feedback was more often conform to instruction or extensive than limited in both groups before and after the training. After the training session, the proportion of extensively filled-out feedback forms significantly increased from 16% to 38% in the trained group χ^2 (4, N=602)=15.17, p=0.00.

DISCUSSION

This study revealed that it is possible to increase the quality of supervisors' verbal feedback and the completeness of their written feedback with a brief training session. The quality of feedback increased significantly after the brief 2.5-hour feedback training session during which supervisors practiced giving feedback in a simulated setting. The residents rated the quality of verbal feedback from trained supervisors higher, and the written feedback from trained supervisors tended to be more complete.

Although the supervisors had only practised providing verbal feedback in a short training, discussing the content of verbal feedback also seemed to have increased the completeness of their written feedback. Written feedback in clinical workplace environments is often of poor quality,³⁶ but our short training significantly improved written feedback. This is a promising finding, especially since supervisors in other settings indicated that only attending a short training session would be feasible.^{27 28}

A distinctive feature of both the training and design of this study is that they are thoroughly grounded in the authentic clinical workplace. The training session was developed by experienced internal medicine educators and applied to internal medicine departments of seven different hospitals, from which all supervisors and residents participated. An essential advantage of setting out the study in the departments as a whole is that it increases the likelihood that similar results can be achieved in other hospital settings. The comprehensive approach allegedly helped us achieve valid and reliable results, although it led to a notable concession in the study design. Due to their busy schedules, it was not feasible to randomly assign supervisors to either the control or trained group. This may have allowed for selection bias. However, since we did not find differences in baseline measurements between both groups, it is unlikely that the effects found should be attributed to factors other than the training session.

The two complementary outcome measures increased the validity of the study. The residents rated the quality of their supervisors' verbal feedback using a standardised questionnaire, which was complemented by an analysis of

Table 2 Quality of feedback in the control and trained group over time with the supervisor as the unit of analysis

Quality of feedback (range: 11–77)	Control group	Trained group	ANOVA*
T ₀ Mean (SD)	61.62 (0.59)	61.68 (0.78)	F (1,164) = 0.02, p=0.89
T _{1,2,3} Mean (SD)	62.72 (7.52)	66.14 (4.64)	F (1,87) = 6.76, p=0.04

*Controlled for hospital.
ANOVA, Analysis of Variance.

Table 3 Completeness of feedback in the control and trained group over time

Completeness of feedback		Limited	Conform instruction	Extensive
Control group	T ₀ % (n)	23% (23)	68% (234)	25% (85)
	T _{1,2,3} % (n)	8% (7)	67% (60)	26% (23)
Trained group	T ₀ % (n)	4% (20)	80% (382)	16% (77)
	T _{1,2,3} % (n)	5% (7)	57% (78)	38% (51)

the completeness of written feedback. Although trained researchers might have scored the quality of the provided feedback differently, the residents are the receiving party, and it, therefore, seems of major importance how they perceive its quality. The study design allowed for comparisons over time, which helped us gain insight into the long-term practical relevance of the training.

This study was limited to measuring the effects of the short training session and, therefore, only reveals the training session's effectiveness without unravelling the exact mechanisms underlying the increase in quality and completeness of feedback. We expect that the characteristic combination of general tips for delivering feedback according to educational standards^{13 35} and discussions about the content of the feedback caused the quality of the supervisors' feedback to improve. Furthermore, this study builds a strong case for the importance of reflection in clinical teaching.³³ Supervisors were trained to prompt reflective thinking by asking probing questions, and this likely resulted in feedback that seamlessly aligned with what residents were ready to learn. In a previous study, we found that supervisors' written feedback on competencies did not always correspond with the official descriptions of these competencies as defined in the original document.³ An underlying mechanism for the training session's effectiveness may be that it evoked discussions about what competencies mean, how to observe them in clinical practice, and how to give residents feedback on these competencies. Further research is necessary to elucidate the exact mechanisms involved.

CONCLUSIONS

Stepping out of the busy daily clinical activities to take a moment to practice and discuss feedback skills seems to increase the quality of feedback up to 6 months afterward. Even a short training session, requiring minimal effort from clinical supervisors, can increase the quality of their feedback. Offering supervisors opportunities to practice giving feedback in simulated settings and reflecting on their performance seems to be an effective way to improve their feedback skills.

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Patient consent for publication Not applicable.

Ethics approval Educational research is exempt from ethical review by Dutch law, so we had no access to an institutional review board. The design of the study, however, is in agreement with the guidelines of the Declaration of Helsinki. We first acquainted both residents and supervisors with the study's aims and sought oral consent to participate. Consent was monitored throughout the period of study as the participants kept voluntarily submitting their feedback forms to the researchers. All data were handled strictly confidentially and anonymised before analysis.

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REFERENCES

- Liao JM, Wachter RM. Grading residents' clinical performance: unique opportunities and challenges. *J Gen Intern Med* 2014;29:983–5.



- 2 Frank JR, Snell LS, Cate OT, *et al.* Competency-based medical education: theory to practice. *Medical Teacher* 2010;32:638–45.
- 3 Renting N, Dornan T, Gans ROB, *et al.* What supervisors say in their feedback: construction of Canmeds roles in workplace settings. *Adv in Health Sci Educ* 2016;21:375–87.
- 4 Ginsburg S, Gold W, Cavalcanti RB, *et al.* "Competencies +plus": the nature of written comments on internal medicine residents' evaluation forms". *Acad Med* 2011;86:S30–4.
- 5 Lurie SJ, Mooney CJ, Lyness JM. Pitfalls in assessment of competency-based educational objectives. *Acad Med* 2011;86:412–4.
- 6 Leslie K, Baker L, Egan-Lee E, *et al.* Advancing faculty development in medical education: a systematic review. *Acad Med* 2013;88:1038–45.
- 7 Holmboe ES, Ward DS, Reznick RK, *et al.* Faculty development in assessment: the missing link in competency-based medical education. *Acad Med* 2011;86:460–7.
- 8 Cole KA, Barker LR, Kolodner K, *et al.* Faculty development in teaching skills: an intensive longitudinal model. *Acad Med* 2004;79:469–80.
- 9 Junod Perron N, Nendaz M, Louis-Simonet M, *et al.* Effectiveness of a training program in supervisors' ability to provide feedback on residents' communication skills. *Adv in Health Sci Educ* 2013;18:901–15.
- 10 Rubak S, Mortensen L, Ringsted C, *et al.* A controlled study of the Short- and long-term effects of a train the trainers course. *Med Educ* 2008;42:693–702.
- 11 Windish DM, Gozu A, Bass EB, *et al.* A ten-month program in curriculum development for medical educators: 16 years of experience. *J Gen Intern Med* 2007;22:655–61.
- 12 Hattie J, Timperley H. The power of feedback. *Review of Educational Research* 2007;77:81–112.
- 13 Archer JC. State of the science in health professional education: effective feedback. *Med Educ* 2010;44:101–8.
- 14 Levine RB, Cayea D. Defining and assessing the 21st-century physician in training. *J Gen Intern Med* 2015;30:1241–2.
- 15 Sargeant J, Eva KW, Armson H, *et al.* Features of assessment learners use to make informed self-assessments of clinical performance. *Med Educ* 2011;45:636–47.
- 16 Johansson J, Skeff KM, Stratos GA. A randomised controlled study of role play in a faculty development programme. *Med Teach* 2012;34:e123–8.
- 17 Elliot DL, Skeff KM, Stratos GA. How do you get to the improvement of teaching? A longitudinal faculty development program for medical educators. *Teach Learn Med* 1999;11:52–7.
- 18 Skeff KM, Stratos GA, Bergen MR, *et al.* Regional teaching improvement programs for community-based teachers. *Am J Med* 1999;106:76–80.
- 19 Gjerde CL, Hla KM, Kokotailo PK, *et al.* Long-term outcomes of a primary care faculty development program at the University of Wisconsin. *Fam Med* 2008;40:579–84.
- 20 Knight AM, Carrese JA, Wright SM. Qualitative assessment of the long-term impact of a faculty development programme in teaching skills. *Med Educ* 2007;41:592–600.
- 21 Kogan JR, Conforti LN, Bernabeo E, *et al.* How faculty members experience workplace-based assessment Rater training: a qualitative study. *Med Educ* 2015;49:692–708.
- 22 Mookherjee S, Monash B, Wentworth KL, *et al.* Faculty development for hospitalists: structured peer observation of teaching. *J Hosp Med* 2014;9:244–50.
- 23 Walsh AE, Armson H, Wakefield JG, *et al.* Using a novel small-group approach to enhance feedback skills for community-based teachers. *Teach Learn Med* 2009;21:45–51.
- 24 Steinert Y, Mann K, Centeno A, *et al.* A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education: BEME guide No.8. *Med Teach* 2006;28:497–526.
- 25 Hewson MG, Little ML. Giving feedback in medical education: verification of recommended techniques. *J Gen Intern Med* 1998;13:111–6.
- 26 Berbano EP, Browning R, Pangaro L, *et al.* The impact of the Stanford faculty development program on ambulatory teaching behavior. *J Gen Intern Med* 2006;21:430–4.
- 27 Battistone MJ, Milne C, Sande MA, *et al.* The feasibility and acceptability of implementing formal evaluation sessions and using descriptive vocabulary to assess student performance on a clinical clerkship. *Teach Learn Med* 2002;14:5–10.
- 28 Hemmer PA, Dadekian GA, Terndrup C, *et al.* Regular formal evaluation sessions are effective as frame-of-reference training for faculty evaluators of clerkship medical students. *J Gen Intern Med* 2015;30:1313–8.
- 29 Minehart RD, Rudolph J, Pian-Smith MCM, *et al.* Improving faculty feedback to resident trainees during a simulated case: a randomized, controlled trial of an educational intervention. *Anesthesiology* 2014;120:160–71.
- 30 Dudek NL, Marks MB, Wood TJ, *et al.* Quality evaluation reports: can a faculty development program make a difference *Med Teach* 2012;34:e725–31.
- 31 Renting N, Gans ROB, Borleffs JCC, *et al.* A feedback system in Residency to evaluate Canmeds roles and provide high-quality feedback: exploring its application. *Med Teach* 2016;38:738–45.
- 32 Gans ROB. Mentoring with a formative portfolio: a case for reflection as a separate competency role. *Med Teach* 2009;31:883–4.
- 33 Litzelman DK, Stratos GA, Marriott DJ, *et al.* Beneficial and harmful effects of augmented feedback on physicians' clinical-teaching performances. *Acad Med* 1998;73:324–32.
- 34 Lizzio A, Wilson K. Feedback on assessment: students' perceptions of quality and effectiveness. *Assessment & Evaluation in Higher Education* 2008;33:263–75.
- 35 Ramani S, Krackov SK. Twelve tips for giving feedback effectively in the clinical environment. *Med Teach* 2012;34:787–91.
- 36 Jackson JL, Kay C, Jackson WC, *et al.* The quality of written feedback by attendings of internal medicine residents. *J Gen Intern Med* 2015;30:973–8.