Evaluating the SPIKES Model for Improving Peer-to-Peer Feedback Among Internal Medicine Residents: a Randomized Controlled Trial

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BACKGROUND: Feedback improves trainee clinical performance, but the optimal way to provide it remains unclear. Peer feedback offers unique advantages but comes with significant challenges including a lack of rigorously studied methods. The SPIKES framework is a communication tool adapted from the oncology and palliative care literature for teaching trainees how to lead difficult conversations.

OBJECTIVE: To determine if a brief educational intervention focused on the SPIKES framework improves peer feedback between internal medicine trainees on inpatient medicine services as compared to usual practice.

DESIGN: Randomized, controlled trial at an academic medical center during academic year 2017–2018.

PARTICIPANTS: Seventy-five PGY1 and 49 PGY2 internal medicine trainees were enrolled. PGY2s were randomized 1:1 to the intervention or control group.

INTERVENTION: The intervention entailed a 30-min, case-based didactic on the SPIKES framework followed by a refresher email on SPIKES sent to PGY2s before each inpatient medicine rotation. PGY1s were blinded as to which PGY2s underwent the training.

MAIN MEASURES: The primary outcome was PGY1 evaluation of the extent of feedback provided by PGY2s. Secondary outcomes included PGY1 report of feedback quality and PGY2 self-report of feedback quantity and quality. Outcomes were obtained via anonymous online survey and reported using a Likert scale with a range of one to four.

KEY RESULTS: PGY1s completed 207 surveys (51% response rate) and PGY2s completed 61 surveys (42% response rate). PGY1s reported a higher extent of feedback (2.5 vs 2.2; $p = 0.02$; Cohen's $d = 0.31$), more specific feedback (2.3 vs 2.0; $p < 0.01$; $d = 0.33$), and higher satisfaction with feedback (2.6 vs 2.2; $p < 0.01$; $d = 0.47$) from intervention PGY2s. There were no significant differences in PGY2 self-reported outcomes.

CONCLUSIONS: With modest implementation requirements and notable limitations, a brief educational

intervention focused on SPIKES increased PGY1 perception of the extent, specificity, and satisfaction with feedback from PGY2s.

KEY WORDS: peer feedback; graduate medical education; surveys.

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INTRODUCTION

Feedback is an integral component of graduate medical education and improves resident clinical performance.^{1–3} Residents value receiving feedback and learning how to offer it to others,⁴ and residency programs across multiple specialties are expected to provide feedback based on Accreditation Council for Graduate Medical Education (ACGME) requirements.^{5–7}

Despite the widely recognized value of feedback, the optimal way to provide it remains unclear. Assessments of attending-led feedback have been mixed,⁸ and evidence supporting peer-led assessments is growing. Residents perceive peer assessments as valuable, supportive of team dynamics, and distinctly insightful compared to feedback from attendings.^{9–11} Although not limited to peer feedback alone, multiple limitations such as time constraints, concern for undermining professional relationships, fear of having to navigate challenging emotional reactions, and a lack of knowledge on how to provide constructive criticism commonly lead to infrequent, poor-quality feedback.^{12–14}

Feedback is a teachable skill: equipping educators with a feedback framework increases the frequency of feedback,^{15, 16} and brief interactive workshops can improve feedback provision with sustained effects.¹⁷ More robust data is needed to guide best practices for training residents how to give feedback, and in particular, there is an absence of randomized trials assessing peer feedback strategies.¹⁸

Since its inception in 2000, the SPIKES model has been widely utilized as a communication tool in oncology and palliative care.^{19–22} More recently, Thomas and Arnold adapted the SPIKES model as an aid for providing feedback (Fig. 1).²³

This study has not previously been presented at a conference or published elsewhere.

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Set up	Know the standards for learners at this stage. Consider the setting/timing
Perception	Ask for learner reflection
Invitation	Be sure feedback is expected and its purpose is clear
Knowledge	Give specific, non-evaluative comments that relate directly to the situation
Emotions	Attend to emotions evoked by the situation or by the feedback given
Strategize	Develop an action plan addressing the learning goals and providing follow-up to ensure progress is monitored

Fig. 1 The SPIKES model for providing constructive feedback, adapted from Thomas JD, Arnold RM. Giving Feedback. *J Pall Med.* 2011; 14(2):233-9.

We focused on SPIKES because it offers a concise framework that captures commonly accepted qualities of good feedback: timely, actionable, and specific.^{2, 20, 21} The SPIKES framework has been demonstrated to be an effective teaching model for improving trainees' ability and comfort with leading difficult conversations.^{24, 25} The SPIKES model was not included as part of the formal residency curriculum during our study, but we anticipated that internal medicine (IM) trainees could still be familiar with the tool based on its roots in the palliative care and oncology literature. Although the SPIKES model stands out for many reasons, it has not been evaluated rigorously as a tool for peer feedback.

We evaluated Post Graduate Year 1 (PGY1) IM residents' perception of the extent and quality of feedback from Post Graduate Year 2 (PGY2) peers trained to use the SPIKES model for feedback. We hypothesized that PGY1s would score higher with respect to the extent and quality of feedback they provided as measured with web-based surveys of both PGY1 and PGY2 residents.

METHODS

We conducted a 12-month, randomized controlled trial of IM resident peer feedback on inpatient medicine rotations at an academic medical center. The study was deemed exempt by the Massachusetts General Hospital (MGH) Institutional Review Board. All participants were provided with the opportunity to opt-out of the study, and those who participated provided informed consent.

Participants and Randomization

The study population consisted of PGY1 and PGY2 residents. To maximize consistency of educational experience across the PGY2 residents in the study, four medicine-pediatric residents and one resident who

transferred into the program were excluded prior to randomization. Additionally, one PGY2 resident opted out, four were excluded due to initial rotation distribution, and a study investigator (EAK) was excluded (Fig. 2).

With respect to education training prior to the PGY2 year, our program's intern curriculum during academic year 2016–2017 entailed several hours of training in clinical leadership; providing feedback was not a prominent component of this training.

At the start of academic year 2017–2018, PGY2 residents were randomized 1:1 to the intervention and control groups via random number generator stratified for number of inpatient rotations in the academic year. One month prior to the academic year in which the study took place, all PGY2 residents in the intervention arm attended a 30-min case-based didactic session on the use of the SPIKES model for feedback led by study investigators (VC and MB, Appendices 1–3). At the start of each inpatient rotation, intervention PGY2 residents received a refresher on the SPIKES model for feedback via email (Appendix 4). PGY2 residents randomized to the control group followed usual practice and did not receive a didactic or email refreshers.

Also at the start of academic year 2017–2018, PGY1s were notified via email that a program-wide study of peer feedback was being conducted and that they would receive optional, anonymous surveys to complete in exchange for an incentive. PGY1s were not informed of the specific aims of the study nor the details of its intervention, and PGY1s were not randomized.

Setting

MGH IM residents rotate through two models of inpatient medicine teams. The study took place during academic year 2017–2018 during which there were six services based on the first model ("Traditional Model"). The Traditional Model was comprised of a team of four PGY1 residents, one PGY2

Fig. 2 CONSORT Flow Diagram of PGY2 Participants.

resident, two attendings, a variable number of medical students, and a maximum census of 15–18 patients. Rotations on Traditional Model teams lasted for two or four weeks. PGY1 residents on the Traditional Model rotated daily between different roles in patient care such as devising the daily plan for established patients, admitting new patients, and caring for established patients.

There were also three services based on the second model (“Flex Model”), which entailed a team of two PGY1 residents, one PGY2 resident, one attending, a variable number of medical students, and a maximum census of 13–14 patients. Rotations on Flex Model teams lasted for two weeks. Each PGY1 resident followed her/his own list of patients, formulating the daily plan of care, and completing tasks each day for established patients while admitting new patients every other day.

The PGY2 resident on both Traditional and Flex models is expected to lead rounds, coordinate patient disposition, and guide educational efforts. PGY3 residents serve multiple roles in our hospital, but they do

not lead general inpatient medicine teams and were therefore not included in this study.

Survey Design and Implementation

At the time of study design, no published surveys evaluating perception of peer feedback were identified. We developed survey items based on well-recognized qualities of effective feedback: timely, actionable, specific, and development of a learning plan.^{2, 26, 27} We vetted the questionnaires with an institutional coalition of medical education experts, the Center for Education, Innovation, and Scholarship. We deferred a pilot survey to avoid exposing a small sample size to our intervention and outcomes.

We created two surveys: the first was sent to PGY1 residents for evaluating PGY2 resident feedback, and the second was sent to PGY2 residents for self-assessment of the feedback they provided to PGY1 residents (Appendices 5–6). Surveys consisted of eight to nine questions consisting of multiple choice and open-ended questions. For each multiple-choice question, four options were provided offering a range of responses about the

extent or quality of feedback (e.g., “Not at all satisfied,” “Somewhat satisfied,” “Very satisfied,” “Extremely Satisfied”). For data analysis, each of the four options for these multiple choice-questions represented a Likert score of one to four.

We administered surveys confidentially upon completion of each rotation via a secure third-party web-based software (REDCap, Nashville, TN). The survey remained open for one week, and all participants received up to two email reminders to complete the survey. We provided incentives in the form of \$15 gift cards to the hospital’s cafeteria to both PGY1s and PGY2s for each completed survey.

Outcomes

The primary outcome was a composite of the extent of feedback received from PGY2 residents at the middle and end of a rotation, as reported by the PGY1 residents. We chose a composite primary outcome to capture the total feedback PGY1 residents received throughout the rotation.

Secondary outcomes obtained from PGY1 surveys included quality markers such as feedback specificity, actionability, whether the PGY2 resident assisted with developing a learning plan, PGY1 resident satisfaction with the feedback they received, and PGY1 resident self-evaluation of proficiency at giving feedback to others. We also solicited qualitative comments through the open-ended question “Please offer any further comments about your experiences giving or receiving feedback.”

Secondary outcomes obtained from PGY2 surveys included self-report of feedback extent, specificity, and actionability of feedback provided to PGY1 residents as well as learning plan development/implementation and PGY2 resident self-evaluation of proficiency at providing feedback. We also solicited qualitative comments via the same open-ended question posed to PGY1 residents.

Statistical Analysis

The unit of the analysis was the individual PGY2 resident. We used repeated measures analysis with the generalized estimating equations (GEE) approach to take into account the clustering of PGY1 residents evaluating each PGY2 resident. We conducted all analyses using SAS version 9.4 (SAS Institute, Cary, NC). We considered a two-sided $p < 0.05$ as statistical significance, and we reported effect size using Cohen’s d .

The original sample size calculation assumed four PGY1 assessments per PGY2 and an intraclass correlation coefficient of 0.1 within each PGY2 cluster. A sample size of 200 PGY1 surveys would be equivalent to an effective sample size of 156 (78 per group). Based on the assumption of a standard deviation of two, the study would have 80% power to detect a mean difference of 0.92 (a relative 15% difference) between intervention and control groups.

Table 1 PGY2 Demographics

Demographic	Intervention (<i>n</i> = 24)	Control (<i>n</i> = 25)
<i>N</i> , female (%)	8 (33%)	15 (60%)
#Weeks total, mean (SD)	9.6 (2.0)	8.9 (2.3)
#Weeks Traditional	6.8 (2.2)	6.5 (2.5)
#Weeks Flex	2.8 (1.2)	2.4 (1.0)
#PGY1 Surveys completed about each PGY2, mean (SD)	4.1 (1.9)	4.3 (1.9)
#PGY2 Surveys completed by each PGY2, mean (SD)	1.3 (1.1)	1.2 (1.2)
# Rotations each PGY1 spent with PGY2s, mean (SD)	3.8 (1.0)	3.4 (1.2)

RESULTS

A total of 124 residents participated in the study (49 of 60 PGY2s, 82% participation rate; 75 of 77 PGY1s, 97% participation rate) (Table 1). Of a possible 407 PGY1 responses, 206 were obtained (51% PGY1 response rate). Of a possible 145 PGY2 responses, 61 were obtained (42% PGY2 response rate). The intraclass correlation coefficient was 0.115 within each PGY2 cluster.

PGY2s in the intervention and control groups spent similar amounts of time on the different inpatient services and had similar numbers of surveys completed about them. Fewer women were represented in the intervention group as compared to the control group (33% vs 60%) due to small sample size and randomization that was not stratified for gender.

Primary Outcome

PGY1 residents reported more extensive feedback from PGY2 residents in the intervention group compared to PGY2 residents in the control group (Table 2). For the composite outcome of mid- and end-rotation feedback reported on a Likert scale with a range of one to four, with one associated with the phrase “I received no feedback” and four associated with the phrase “I received extensive feedback, e.g. an in-depth discussion,” PGY2 residents in the intervention group had a mean score of 2.5 compared to a mean score of 2.2 for PGY2 residents in the control group ($p = 0.02$; $d = 0.31$).

PGY1 residents reported equivalent mid-rotation feedback with a mean score of 2.2 ($p = 0.80$) but more extensive end-rotation feedback from intervention PGY2s with a mean score of 2.7 versus 2.2 in the control group ($p < 0.01$; $d = 0.45$). The primary outcome did not vary between the Traditional and Flex service models.

Secondary Outcomes

PGY1 residents reported more specific feedback from intervention PGY2s. On a scale from one to four, with a score of one associated with the phrase, “Not specific at all: I rarely or never received specific feedback” and four associated with the phrase “Extremely specific: >75% of the feedback I received was specific”, PGY2 residents in the intervention arm scored a

Table 2 PGY1 Evaluations of Feedback Received from PGY2s

Outcome	Intervention (<i>n</i> = 99) Mean (SD)	Control (<i>n</i> = 107) Mean (SD)	<i>p</i>	Cohen's <i>d</i>
Extent of feedback	2.5 (1.0)	2.2 (1.0)	0.02	0.31
Mid-point	2.2 (1.0)	2.2 (1.0)	0.80	
Endpoint	2.7 (1.1)	2.2 (1.1)	< 0.01	0.45
Specificity	2.3 (1.0)	2.0 (0.8)	< 0.01	0.33
Actionable	2.3 (1.0)	2.0 (0.9)	0.07	
Learning plan	1.8 (1.1)	1.7 (0.9)	0.24	
Satisfaction	2.6 (0.9)	2.2 (0.8)	< 0.01	0.47
Proficiency giving feedback	2.1 (0.6)	2.1 (0.5)	0.94	

mean of 2.3 compared to 2.0 in the control arm ($p < 0.01$; $d = 0.33$).

With a score of one associated with the phrase, “Not at all satisfied” and four associated with the phrase “Extremely satisfied”, PGY1 residents also reported higher satisfaction with feedback from PGY2 residents in the intervention group with a mean 2.6 compared to 2.2 in the control group ($p < 0.01$; $d = 0.47$). There was no significant difference in how actionable feedback was, the development of a learning plan, or PGY1 self-perception of proficiency at giving feedback.

None of the outcomes reported by PGY2 residents reached statistical significance (Table 3). Notably, PGY2 residents self-reported higher metrics of feedback when compared to PGY1 resident responses.

We tested for gender effect and found similar feedback scores among PGY1s supervised by male or female residents in the control group. Outcomes remained statistically significant in a regression model controlling for gender. Additionally, outcomes did not vary significantly based on time of year or rotation duration.

Qualitative analysis of the open-ended comments will be presented in a separate forum.

DISCUSSION

In the first randomized controlled trial evaluating a peer feedback tool, we demonstrated a concordant increase in PGY1 perception of the extent, specificity, and satisfaction with feedback provided by PGY2 residents who underwent an educational intervention focused on the SPIKES model. There was a low baseline of peer feedback reported by PGY1

residents, and PGY2 residents self-reported higher feedback metrics as compared to PGY1 ratings.

We feel SPIKES addresses many of the well-recognized barriers to peer feedback including the perceived lack of training and time constraints by providing a concise, step-by-step approach. Additionally, residents frequently confuse teaching and feedback or fail to recognize when educators are providing feedback.²⁸ The SPIKES framework incorporates an invitation to provide feedback which could indicate to learners that feedback is occurring when they otherwise would not recognize it.

Our intervention did not differentiate between types of feedback or specify when feedback should be provided, although the didactic includes an example of mid-rotation feedback. The increase in feedback seen in this study was driven by an increase in end-of-rotation feedback, which may reflect recency bias and/or indicate a PGY2 focus on summative feedback. Summative feedback targets overall competency and typically occurs at milestone moments during training, as compared to formative feedback which is non-evaluative and focuses on real-time adjustments.²⁷

The simplicity of our intervention adds to its educational significance. We showed a 14% higher score for the extent of feedback and 18% higher score for satisfaction with feedback with only one 30-min didactic session and several email reminders. Based on the overall insufficient quality and quantity of peer feedback demonstrated in our study and elsewhere in the literature, the 14–18% improvement in outcomes offers an important step forward for a challenging topic within medical education, especially relative to the modest investment of time and resources needed for its implementation. There are also multiple opportunities to expand the intervention from this proof-of-concept study by, for example, adding

Table 3 PGY2 Self-Evaluation of Feedback Provided to PGY1s

Outcome	Intervention (<i>n</i> = 30) Mean (SD)	Control (<i>n</i> = 31) Mean (SD)	<i>p</i>
Extent of feedback	3.2 (0.6)	2.8 (0.7)	0.05
Mid-point	3.0 (0.8)	2.6 (1.0)	0.14
Endpoint	3.4 (0.8)	3.0 (0.8)	0.09
Specificity	2.8 (0.5)	2.9 (0.9)	0.80
Actionable	2.8 (0.6)	2.9 (0.8)	0.89
Learning plan	2.0 (1.0)	1.9 (1.1)	0.79
Proficiency giving feedback	2.3 (0.6)	2.3 (0.5)	0.88

additional didactic sessions throughout the year or focused one-on-one communication training, which may further improve outcomes.

Limitations

There are several limitations to this study. First, this study was conducted within one IM residency program with specific models of inpatient care which limits its generalizability, although the primary outcome did not differ between the two service models. Second, despite survey reminders and incentives, our response rates were 51% and 42% for PGY1 residents and PGY2 residents, respectively. Based on these response rates, nonresponse bias may be present. Furthermore, a response rate of only 42% limits interpretation of the PGY2 self-reported outcomes, including the extent of feedback provided which was higher in the intervention cohort but did not meet the threshold for statistical significance (mean score 3.2 versus 2.8, $p = 0.05$).

At the time of study design, we were unable to identify validated surveys for feedback in the literature and created our own questionnaires based on literature review and consultation with a coalition of medical education experts at our institution. Our surveys were not previously validated, and they were created without a means of assessing reliability.

In comparison to prior studies evaluating SPIKES as a tool for sharing difficult news, our study did not include substantial communication training or a validated evaluation of trainee communication skills. We thought that the communication expertise needed to train and evaluate residents in this fashion would limit uptake of our intervention at other programs such that we prioritized learner perception of feedback in this proof-of-concept study. With a foundation in place, higher impact outcomes such as attending perception of trainee communication skills and patient outcomes should be the focus of future research.

Other feedback frameworks exist, but a limited sample size prevented inclusion of a third arm into the study to compare SPIKES with another model. We also did not survey intervention PGY2s on their feedback practices to confirm usage of SPIKES given the concern for survey fatigue. As such we cannot attribute the results solely to the SPIKES model independent of the remainder of the intervention. The email reminders alone, for example, may account for the increase in feedback in the intervention group.

Finally, we asked PGY2s in the intervention arm not to share details of the intervention with PGY2s in the control cohort or with the PGY1s. We did not assess for cross-contamination in the control arm or for PGY1 understanding of the intervention. It is possible that cross contamination and/or unblinding may have occurred over time.

Future Directions

Feedback is perceived differently between specialties,¹⁸ and additional investigation is warranted to determine if the

SPIKES framework is effective outside of IM where there may be less familiarity with the original communication tool. At our institution, conversations are ongoing regarding implementation of the SPIKES model, and we plan on recording examples for how to provide feedback using SPIKES to facilitate further dissemination.

CONCLUSION

In one of the first randomized trials of a peer feedback tool, a brief educational intervention focused on teaching the SPIKES model for feedback was associated with higher PGY1 satisfaction and ratings of the extent and specificity of feedback from PGY2s. The intervention benefits from modest implementation requirements, but limitations such as its single center nature and unvalidated feedback survey limit its generalizability. Suboptimal ratings of feedback from PGY2s in both the intervention and control arms re-demonstrate the need for improved methods and training for peer feedback.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11606-020-06459-w>.

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Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they have no conflicts of interest.

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