Objective Assessment of Resident Teaching Competency Through a Longitudinal, Clinically Integrated, Resident-as-Teacher Curriculum

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Abstract

Objective: Competency-based training should be paired with objective assessments. To date, there has been limited objective assessment of resident-as-teacher curricula (RATC). We sought to assess the impact of a longitudinal RATC on postgraduate year-1 (PGY1) resident teaching competency using Observed Structured Teaching Encounters (OSTEs) for the skills of 1) brief didactic teaching [DT], 2) feedback [FB], and 3) precepting [PR].

Methods: A controlled, prospective, educational study was conducted from May 2015 to June 2016. The RATC consisted of a workshop series with reinforcement of key skills (DT, FB) during clinical rotations. Intervention residents participated in the RATC and completed OSTEs at the beginning and end of the academic year. A control group, PGY1 residents that matriculated the year previously, completed the OSTEs before starting their PGY2 year. OSTEs were reviewed by 2 blinded study personnel. We assessed reliability between raters via intraclass correlation coefficients and differences in OSTE scores via least squared mean differences (LSMD).

Results: In total, 92.5% (n = 37) of eligible control and 100% (n = 41) of eligible intervention residents participated. The OSTEs demonstrated excellent agreement between reviewers (DT: 0.99, FB: 0.89, PR: 0.98). A significant pre-post difference was demonstrated in the intervention group for DT (LSMD [95% confidence interval], 3.14 [2.49-3.79], $P < .0001$), FB (0.93 [0.49−1.37], $P < .0001$), and PR (0.64 [0.09−1.18], $P < .022$). A significant difference between the control and intervention groups was demonstrated for DT (3.00 [2.05−3.96], $P < .0001$).

Conclusions: Skill-based OSTEs can be used to detect changes in residents' teaching competency and may represent a potential component of programmatic evaluation of resident-as-teacher curricula.

Keywords: observed structured teaching evaluation; resident-as-teacher

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What's New

Observed Structured Teaching Encounters (OSTEs) were able to detect changes in residents' teaching competency, facilitating assessment of a resident-as-teacher curriculum (RATC). OSTEs can be used by institutions to gauge the effectiveness of their own RATCs and allow tailoring of programming.

Graduate medical education emphasizes competency-based assessment.[1-3] In alignment with the Accreditation Council for Graduate Medical Education's core competencies and the Pediatric Milestones Project, assessment tools have been developed and linked to specific competencies for various proficiencies.[4-9] Although teaching capacity is a critical learning objective for residents, assessment of teaching skills remains unstructured. Thus, a variety of "resident-as-teacher" curricula (RATCs) have been developed with outcome metrics primarily limited to reports on satisfaction and self-assessement.[4-12] A lack of objective assessment of teaching competency has limited establishment of best practice approaches to RATCs.

Use of an Observed Standardized Clinical Examination has become an accepted method to assess resident clinical performance.[13-18] Similarly, the use of an Observed Structured Teaching Encounter (OSTE) has been used for faculty development and, to a lesser extent, for residency and fellowship training.[11,19-21] We hypothesize that an OSTE may be used to objectively assess resident teaching skills and, therefore, also may be used to evaluate the effectiveness of RATCs. Previously, we reported that use of an

OSTE could detect differences in resident competency related to teaching.[21] However, that study did not account for resident learning over time that may occur outside of a RATC. Therefore, a novel, comprehensive, clinically integrated RATC with objective assessment of interval change in competency was developed and implemented. Our primary aim was to evaluate the impact of our RATC on pediatric postgraduate year 1 (PGY-1) resident teaching competency for key educational skills, as measured by an OSTE.

METHODS

A controlled, prospective, educational study was performed at Cincinnati Children's Hospital Medical Center (CCHMC) from May 2015 to June 2016. This study was approved by the CCHMC Institutional Review Board.

STUDY SETTING AND PARTICIPANTS

CCHMC is an academic, pediatric medical center with a pediatric residency training program of approximately 40 categorical PGY-1 residents annually. Residents who matriculated in July 2015 comprised the intervention group, and those who started in July 2014 served as the control group. Only intervention group residents participated in the RATC. Residents in both groups completed similar service schedules during their PGY-1 year with an equal number of inpatient and outpatient rotations.

CURRICULUM

Our RATC included 1) an interactive longitudinal workshop series and 2) directed practice integrated into clinical rotations. The workshop series included a 3-hour introduction to adult learning theory, brief didactic teaching, and feedback during PGY-1 orientation. Subsequent monthly 45-minute morning report conferences focused on topics related to teaching (eg, team-based teaching, learning styles, precepting a learner) with refreshers on brief didactic teaching and feedback. Materials for the workshop series were developed de novo by residents, program leadership, and medical educators based on accepted best-practice approaches.

The topics of feedback and brief didactic teaching were additionally reinforced through directed practice during clinical rotations. Specifically, for feedback skills, intervention residents facilitated weekly feedback for medical students on the Hospital Medicine service with direct observation by Hospital Medicine faculty. For brief didactic teaching, intervention residents delivered 2 to 3 pre-clinic teaching sessions with direct observation by General Pediatrics faculty. Specific performance feedback was provided through the use of standard assessments allowing for uniform evaluation and consistent suggestions for improvement. Implementation and assessment of the clinically integrated component of our RATC has been described in a previous publication.[22]

OBJECTIVE ASSESSMENT

OSTEs were developed to assess resident teaching capacity to 1) deliver brief didactic teaching, 2) facilitate feedback, and 3) precept a learner. Brief didactic teaching and facilitating feedback were identified for inclusion by key stakeholders (residency and educational leadership), given the frequent application of those skills as well as our infrastructure available for facilitating directed practice during clinical rotations[22] Precepting a junior learner, while a part of the longitudinal workshop series, was not formally reinforced with directed practice during clinical rotations, offering a metric for assessing the impact of the longitudinal workshop series in isolation on resident performance.

Each OSTE had specific instructions for the resident: a description of a patient scenario, setting, teaching objectives, resources, and the time allotted. A research coordinator simulated a third-year medical student as our standardized learner with scripted responses. The clinical topic for each scenario was preselected, and residents were informed at the time of the OSTE. When clinical subject knowledge was required, a reference sheet was provided with time for review to minimize the impact of variable degrees of clinical knowledge on teaching competency. The clinical topics were the same for all residents and at all assessment time points (intervention pre and post, and control).

Each OSTE included a standardized rubric to assess residents' performance based on best-practices and adult-learning theory. The brief didactic teaching rubric was implemented previously and demonstrated an ability to reliably detect interval change in teaching competency.[21] Specific teaching skills were characterized by 3 clusters of discretely observable behaviors allowing for a score of 1 to 3 per skill (Supplementary Fig. 1). Where appropriate, skills were grouped into subcompetencies. An overall score was generated based on the observed behaviors demonstrated by the resident. The rubric for brief didactic teaching used 9 skills clustered into the 3 generally accepted subcompetencies of preparation, teaching, and reflection (overall score range of 9−17).[21] This same structure was applied to develop new rubrics for feedback and precepting. Facilitating feedback used 4 skills clustered into 2 subcompetencies of teaching and reflection (overall score range 4−12), whereas precepting consisted of 5 key skills clustered into one subcompetency of teaching (overall score range 5−15).

All study rubrics were reviewed and iteratively adapted by 4 attending physicians with advanced training in medical education from CCHMC's Divisions of Hospital Medicine, Emergency Medicine, and General and Community Pediatrics. The rubrics were piloted with 5 senior residents and amended accordingly. Each OSTE scenario was videotaped and subsequently reviewed by 2 physician authors (D.D., F.R., B.S., K.J., N.U., M.K.). All videos were filmed by a clinical research coordinator,

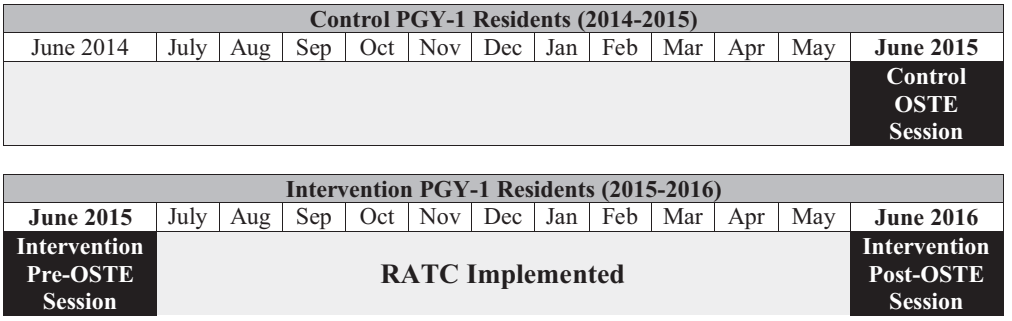

Figure. *Timing of OSTEs and RATC implementation for control and intervention residents with residents completing 3 OSTE scenarios (didactic teaching, feedback, and precepting) at each assessment period. OSTE indicates Observed Structured Teaching Encounter; and RACT, resident-as-teacher curricula.*

deidentified, and stored in a secure database for later review. Each evaluator only scored one OSTE scenario. Initially, evaluators reviewed 4 videos together to discuss scoring consistency and resolve discrepancies. OSTE scenarios were reviewed and scored several months following completion of the study period to optimize blinding of participant group assignment and timing of the teaching encounter. Through this approach, we strove to establish content, response process, and internal structure validity for our assessment strategy.

Study Design, Data Collection, and Statistical Analysis

All residents provided demographic data, including age, race, and degrees received. Demographic and baseline characteristics were compared between control and intervention groups using the Fisher exact test for categorical variables.

The RATC was implemented during the 2015 to 2016 academic year. The control group performed OSTE sets at the end of their PGY-1 year, before RATC implementation (Figure). Although all residents could attend the RATC workshop series, only the intervention group completed OSTE sets (3 scenarios—brief didactic teaching, feedback, and precepting) at the beginning and end of the academic year (Figure). Pre- to post-curriculum differences in OSTE scores were evaluated using least square mean differences (LSMD). Control OSTE scenario scores were compared with the intervention postcurriculum OSTE scenario scores using LSMD.

Reliability between reviewers for the OSTE scenarios was assessed using intraclass correlation coefficients through mixed modeling. Resident demographic information and OSTE performance data were deidentified and entered into a Research Electronic Data Capture database.[23]

Results

Participant Demographics

Of all eligible participants, 37 control (92.5%) and 41 intervention residents (100%) participated. Three control residents and 6 intervention residents could not be included in final data analysis due to missing data secondary to corrupted video files. There were no significant differences between the control and intervention groups for age or race; however, there was a difference for degrees received (Table 1).

OSTE Results

Intervention residents demonstrated a statistical pre- to post-curriculum difference in OSTE scores for all 3 teaching skills (LSMD [95% confidence interval]: didactic teaching: 3.14 [2.49−3.79], $P < .0001$; feedback: 0.93 [0.49−1.37], $P < .0001$; and precepting: 0.64 [0.09 −1.18], $P < .022$) (Table 2). When comparing control

Table 1. Study Participants' Demographic Information

	Control (n = 34)	Intervention (n = 35)	*P* Value
Age, mean (IQR)	27 (27, 29)	28 (27, 29)	.57
Race, n (%)			.24
While or Caucasian	25 (73.5%)	28 (80.0%)	
Black or African American	0 (0%)	3 (8.6%)	
Asian	4 (11.8%)	1 (2.9%)	
Hispanic or Latino	3 (8.8%)	1 (2.9%)	
Other	2 (5.9%)	2 (5.7%)	
Degrees, n (%)			.03
MD/DO	23 (67.6%)	32 (91.4%)	
MD/DO, PhD	4 (11.8%)	0 (0%)	
MD/DO, other	7 (20.5%)	3 (8.6%)	

P value from the Wilcoxon rank sum test for age and Fisher exact test for categorical variables.
IQR indicates interquartile range.

Table 2. OSTE Results and Reviewer Reliability

	Intervention Pre−Post Difference		Intervention and Control Difference		
	Least Square Mean Difference [95% CI]	*P* Value	Least Square Mean Difference [95% CI]	*P* Value	ICC Reliability Between Reviewers
Didactic teaching	3.14 [2.49−3.788]	<.0001*	3.00 [2.05−3.96]	<.0001*	0.99
Feedback	0.93 [0.49−1.37]	<.0001*	0.132 [-0.56−0.828]	.702	0.89
Precepting	0.64 [0.09−1.18]	.022*	0.13 [-0.70−0.95]	.751	0.98

P value from least square mean differences.

OSTE indicates Observed Structured Teaching Encounter; CI, confidence interval; and ICC, intraclass correlation coefficient through mixed modeling.

*Denotes statistical significance.

OSTE with intervention postcurriculum OSTE scores, a statistical difference was demonstrated for the didactic teaching skill 3.00 [2.05−3.96], $P < .0001$. No difference was seen for the skills of feedback (0.132 [−0.56 to 0.83], $P = .702$) nor precepting (0.13 [−0.70 to 0.95], $P = .751$) (Table 2). Intraclass correlation coefficients through mixed modeling demonstrated high reliability of rater scoring for the 3 OSTE scenarios: didactic teaching 0.99, feedback 0.89, and precepting 0.98 (Table 2).

DISCUSSION

We successfully implemented a comprehensive RATC incorporating a longitudinal workshop series and reinforcement through clinical integration of key skills. We assessed change in resident teaching ability through OSTEs with reliable rubrics on the topics of brief didactic teaching, feedback, and precepting. Residents exposed to our RATC improved in all 3 skills following the curriculum. When compared with a control group, intervention residents demonstrated improved brief didactic teaching skills. This study is unique in its use of an objective assessment to measure change in teaching competency over an academic year, as well as to evaluate the effects of a RATC on teaching competency.

Objective assessment of competence is vital for tracking learner development and ensuring readiness for practice.[4-9] This same standard should apply to teaching skills. OSTEs have demonstrated effectiveness in assessing teaching proficiency.[11,19-21] The structure of the OSTE allows for specific feedback on observable skills and behaviors, facilitates deliberate practice,[24] and standardizes expectations aligning with the goals of the Accreditation Council for Graduate Medical Education Core Competencies and Pediatric Milestones Project.[1-3] We developed OSTEs and rubrics using content experts and anchoring of scoring among evaluators to allow for objective assessment of residents' teaching skills. This approach allowed for 2 key benefits: 1) the tracking of learner development over time and 2) objective data for tailoring our RATC.

When comparing intervention with control residents, a significant difference was noted for the skill of brief didactic teaching. This was a key component of our RATC that was reinforced in the clinical setting. This finding suggests that completing residency rotations alone might not be sufficient to train residents in this skill, supporting the need for RATCs.[4-12] Conversely, although competency at facilitating feedback and precepting a learner improved over the course of the academic year among intervention residents, there was no statistical difference when compared with controls. This finding suggests 1 of 3 conclusions: 1) that feedback and precepting skills may be adequately attained at our institution through clinical rotations alone, 2) that our curriculum was not an effective intervention in producing significant change in performance, or 3) that our evaluation rubrics for facilitating feedback and precepting a learner were not valid measures of these respective skills. However, given our previously described thoughtful approach to establishing validity for these tools, we believe that option three may be less likely.[21]

These results suggest that objective assessment of RATCs through OSTEs can provide valuable information regarding knowledge gaps among residents related to teaching. In addition, our findings suggest the continued need for RATCs as some critical teaching skills, such as brief didactic teaching, are not necessarily learned over the course of clinical rotations.

Our study had several limitations. First, we only included one pediatric residency program; therefore, clinical and educational experiences may not be generalizable. Use of our tools with different populations of learners and institutions would aid in establishing the validity of these metrics. Second, we did not track participation in the workshop series, which limits our ability to assess individual curricular components. Future studies would benefit from tracking of learner participation to allow assessment of associations between curriculum components and learner performance. Third, the lack of a pre-year assessment for our control group prevented assessment of change in skills over their PGY-1 year. This was a logistical limitation that would need to be addressed in future studies to limit confounders when assessing the efficacy of curricular components. However, this limitation does not detract from the learnings that can be taken from comparison of the end of year OSTE performances between groups.

CONCLUSIONS

Graduate medical education programs can only move toward competency-based training if curricular interventions are paired with objective assessment. Skill-based OSTE scenarios represent an approach to objectively assess resident teaching competency, which has potential implications for bolstering individualized training as well as programmatic evaluation.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.acap.2019.01.011.

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