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# Developing and Implementing a Multisource Feedback Tool to Assess Competencies of Emergency Medicine Residents in the United States

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## ABSTRACT

**Objectives:** Multisource feedback (MSF) has potential value in learner assessment, but has not been broadly implemented nor studied in emergency medicine (EM). This study aimed to adapt existing MSF instruments for emergency department implementation, measure feasibility, and collect initial validity evidence to support score interpretation for learner assessment.

**Methods:** Residents from eight U.S. EM residency programs completed a self-assessment and were assessed by eight physicians, eight nonphysician colleagues, and 25 patients using unique instruments. Instruments included a five-point rating scale to assess interpersonal and communication skills, professionalism, systems-based practice, practice-based learning and improvement, and patient care. MSF feasibility was measured by percentage of residents who collected the target number of instruments. To develop internal structure validity evidence, Cronbach's alpha was calculated as a measure of internal consistency.

**Results:** A total of 125 residents collected a mean of 7.0 physician assessments ( $n = 752$ ), 6.7 nonphysician assessments ( $n = 775$ ), and 17.8 patient assessments ( $n = 2,100$ ) with respective response rates of 67.2, 75.2, and 77.5%. Cronbach's alpha values for physicians, nonphysicians, patients, and self were 0.97, 0.97, 0.96, and 0.96, respectively.

**Conclusions:** This study demonstrated that MSF implementation is feasible, although challenging. The tool and its scale demonstrated excellent internal consistency. EM educators may find the adaptation process and tools applicable to their learners.

As residency programs strive to develop, implement, and refine assessment strategies that align with the Accreditation Council on Graduate Medical Education (ACGME)'s Next Accreditation System, program directors are approaching a common problem: How can workplace-based assessment best capture learner performance in a way that provides meaningful data to inform clinical competency

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committee decisions on developmental milestone progression within the ACGME subcompetencies?<sup>1</sup> This quandary is relevant to undergraduate medical educators as well, as medical schools explore methods for assessing students' progress in the Core Entrustable Professional Activities for Entering Residency.<sup>2</sup>

Multisource feedback (MSF), or 360-degree feedback, is a workplace-based assessment method that has been piloted in a variety of U.S. specialties, including emergency medicine (EM), internal medicine, anesthesiology, pediatrics, and family medicine, and has been in use for assessment of practicing physicians by The College of Physicians and Surgeons of Alberta (CPSA) Physician Achievement Program for the past decade.<sup>3–8</sup> As part of the CPSA's work, a set of MSF instruments was created for physicians who provide episodic care (including emergency physicians, locum physicians, physicians serving walk-in populations, urgent care physicians, hospitalists, and niche or specialty primary care physicians such as family planning and low-risk obstetrics). These instruments included specific questionnaires for patients, physician colleagues, nonphysician colleagues, and self-assessment. While there is validity evidence to support their use in practicing physicians, MSF instrument use in resident assessment has not been previously studied.<sup>9</sup> Furthermore, although the existing instruments were developed for episodic care, they have not been adapted specifically for the emergency department (ED) setting, which limits EM educators' ability to apply them to learner assessment.

We adapted the CPSA MSF instruments for use in workplace-based assessment of EM residents in the ED. In this innovation report, we present a framework for adapting the CPSA physician colleague, patient, nonphysician colleague, and self-assessment instruments for resident assessment and report the results of a pilot implementation in eight U.S. EM residency programs.

## METHODS

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### Study Design

This was a prospective multisite study aiming to evaluate the feasibility of implementing an MSF system in a convenience sample of EM residents from eight U.S. residency programs. All sites obtained approval from their respective institutional review boards (IRBs).

### Study Setting and Population

The study was conducted in eight geographically diverse EM training programs across the United States, including both 3- and 4-year residency formats. Residents were enrolled on a voluntary basis after informed consent was obtained.

### Study Protocol

**Multisource Feedback Instrument Development.** The specific questionnaires for patients, physician colleagues, nonphysician colleagues, and self-assessment developed by the CPSA for MSF use were reviewed and revised by content experts during focus group sessions at the 2010 Council of Emergency Medicine Residency Directors (CORD) Academic Assembly to optimize content validity. Twenty residency leaders, divided into four focus groups, examined existing items, came to consensus on items most applicable for assessment of EM residents, and revised items to reflect the ACGME competencies rather than Canadian Medical Education Directions for Specialists framework. Items relating to medical knowledge were omitted as focus group members felt that this competency was best assessed using other methods. After an iterative process of item refinement, a total of 96 items were included in four questionnaires. All forms used a Likert-type scale (from 1 = strongly disagree to 5 = strongly agree; Data Supplement S1, Supplementary Files S1–S4, available as supporting information in the online version of this paper, which is available at <http://onlinelibrary.wiley.com/doi/10.1002/aet2.10043/full>). All instruments were piloted on a small sample of residents, patients, medical colleagues and coworkers, and feedback was solicited for clarity and format. The instruments were then revised based on this feedback to ensure credibility and understanding of items and to optimize response process validity. The process of adapting the instruments for use in the ED setting took approximately 20 hours of the study team's time, cumulatively.

### Multisource Feedback Instrument Distribution and Collection.

A convenience sample of residents rotating in the ED during each site's data collection period were invited to participate. Data collection occurred in 2012 and 2013, and start dates varied based on timing of IRB approval. Participants were asked to complete a self-evaluation and identify eight nonphysician coworkers and eight physician colleagues (including preceptors) to respond to the items.

Research volunteers recruited 25 patients systematically (i.e., every third patient) to assess participating residents during clinical shifts in the ED (Supplementary File S4). Target numbers for all questionnaires were based on prior work.<sup>9</sup> Data collected for the study were not provided to the resident's supervisors. All data were deidentified prior to analysis.

### Key Outcome Measures

To measure MSF instrument feasibility, we tracked the percentage of resident participants who collected the target number of assessment instruments. To begin to develop internal structure validity evidence to guide score interpretation from the instruments, we calculated internal consistency using Cronbach's alpha. To provide guidance to residencies that may wish to implement similar systems, we asked site principal investigators to report whether they used research volunteers to conduct the study and describe the faculty and staff time required to implement the intervention.

### Statistical Methods

For each instrument scale we calculated descriptive statistics for the score and the number of respondents, including mean, standard deviation (SD), and skew answers. Data were analyzed using Stata 12. Cronbach's alphas were calculated to assess internal consistency reliability for each scale on each instrument. A Cronbach's alpha greater than 0.9 was interpreted as providing high internal consistency reliability.<sup>10</sup>

## RESULTS

A total of 125 PGY-1 to PGY-4 residents from the eight sites volunteered to participate during the study period. Residents collected a mean of 7.0 physician assessments ( $n = 752$ ; 95% confidence interval [CI] = 6.7–7.3), 6.7 nonphysician assessments ( $n = 775$ ; 95% CI = 6.5–7.0), and 17.8 patient assessments ( $n = 2100$ ; 95% CI = 16.2–19.4) with respective response rates of 67.2, 75.2, and 77.5%. Mean scores for the physician, nonphysician, patient, and self evaluators are displayed in Tables 1–4. All eight participating sites used research assistants to facilitate data collection. Sites reported the system as being labor-intensive to implement, with significant time and resources required to advertise the study, train residents and research volunteers, collect data and follow up on distributed surveys, and enter data into the database.

Internal consistency was high for all questionnaires and factor groupings as measured by Cronbach's alpha. Cronbach's alpha overall for the physician, nonphysician, and patient questionnaires were 0.97, 0.97, and 0.96 respectively (Tables 1–3).

## DISCUSSION

The literature supports the use of MSF to assess resident performance, particularly for the subcompetencies of professionalism and interpersonal and communication skills.<sup>3</sup> In this study, we present a set of MSF instruments adapted for use in the ED setting from previously published instruments developed to measure resident behaviors across five core competencies in episodic care settings. While our pilot implementation of the instruments in eight diverse residency programs demonstrated excellent internal consistency (Cronbach's alpha = 0.96–0.97), we found that even with universal use of research assistants to facilitate data collection, it was difficult to achieve target numbers of assessments in all sites.

Although tracking exact costs and work hours required to implement the system at all sites was not possible, the consensus from site directors was that the system was fairly labor-intensive to implement and track data. Lessons learned from our pilot may be helpful to program directors wishing to implement a feasible and sustainable MSF system or to guide future studies collecting validity evidence to support MSF instrument score interpretation. Our MSF system used paper-based questionnaires and required significant time and resources from each site team to assure completion from all sources. An electronic version of the instruments may help improve completion rates. Similarly, an electronic database may aid in ease of instrument analysis.

We arbitrarily chose to approach every third patient with a questionnaire. While this may have impacted our ability to achieve our goal of 25 patients per resident, our study demonstrated that even with an average of just over 17 patients, we achieved reliability with an overall Cronbach's alpha of 0.96. This suggests that the number of patients needed for a reliable assessment may be less than our goal of 25, which would improve the feasibility of the assessment strategy.

Although overall mean scores were similar among assessors, self-assessment had the lowest score for all competencies (Table 4), consistent with prior literature that suggests self-assessment does not correlate well with external assessment.<sup>11</sup> However, several findings

**Table 1**  
Physician Evaluator Descriptive Statistics and Internal Consistency

Items	<i>n</i>	Mean	SD
Communicates effectively with patients and families	745	4.49	0.65
Communicates effectively with other health professionals	751	4.47	0.69
Establishes patient rapport	741	4.5	0.64
Communicates effectively in critical situations	728	4.38	0.76
Works effectively as a member of the team	747	4.61	0.62
Handoffs are effective	734	4.43	0.7
Responsive to concerns raised by other team members	737	4.57	0.65
Maintains patient confidentiality	745	4.77	0.44
Demonstrates respect for others regardless of sex, ethnicity, or disability	749	4.76	0.50
Presents self in a professional manner	752	4.68	0.55
Demonstrates empathy	750	4.62	0.62
Is respectful to coworkers	752	4.75	0.51
Demonstrates appropriate concern for safety	747	4.56	0.62
Participates in identifying system errors	725	4.18	0.82
Participates in development of system solutions	721	4.13	0.89
Considers patients' socioeconomic and psychosocial needs to provide optimal patient care	739	4.35	0.74
Accesses resources to guide patient care	742	4.42	0.69
Teaches colleagues	741	4.22	0.84
Accepts feedback	747	4.59	0.65
Recognizes limits of expertise	747	4.56	0.69
Recognizes situations in which an urgent response is needed	748	4.59	0.62
Reassesses response to interventions	749	4.50	0.66
Identifies pertinent physical findings based on patient complaint	747	4.52	0.64
Prioritize vital critical actions in the resuscitation of a critically ill patient	739	4.47	0.68
Effectively manages multiple tasks simultaneously	746	4.37	0.75
Identifies most likely diagnosis based on patient presentation	745	4.52	0.63

Cronbach's alpha (overall 0.97).

are interesting and are worthy of note. For interpersonal and communication skills, residents' self-assessment scores were lowest and patient scores were highest. This suggests that resident communication is well received by patients, even when residents feel they have room to improve. Systems-based practice scores were also lowest on self-assessments and highest on patient assessments. This may imply that even if residents feel unprepared to navigate the healthcare system, this perceived deficit does not correlate with patient perceptions of systems-based practice performance. Further work is needed to explore whether confidence, competence, or other factors contribute most to lower self-assessment on all competencies compared to patient or physician assessments.

## LIMITATIONS

Our pilot implementation of a MSF tool for workplace-based assessment of resident performance in

an episodic care setting has several limitations. Although we present preliminary feasibility and internal consistency results for our instruments, further work is needed to determine if implementation in the ED is feasible (particularly if research assistants are not available) and further validity evidence would be helpful to support score interpretation. Furthermore, due to the degree of resources required to collect instruments, our sample size was limited and fewer complete sets of instruments were collected than projected. The instruments use a Likert-type scale where 4 = agree and 5 = strongly agree, which may promote a skewed distribution of data as most assessors select one of these options. Finally, in our study subjects selected their own physician and non-physician colleague assessors. This raises the potential of a systematic leniency bias that could elevate the scores of the scaled assessments.<sup>6</sup> However, alternative methods of selecting the assessors would have been challenging to develop and implement in a

**Table 2**  
Nonphysician Evaluator Descriptive Statistics and Internal Consistency

Items	<i>n</i>	Mean	SD
Communicates effectively with patients and families	768	4.48	0.68
Communicates effectively with other health professionals	773	4.47	0.76
Establishes patient rapport	766	4.46	0.67
Works effectively as a member of the team	773	4.53	0.69
Handoffs are effective	719	4.33	0.77
Responsive to concerns raised by other team members	757	4.48	0.73
Maintains patient confidentiality	768	4.69	0.53
Demonstrates respect for others regardless of sex, ethnicity, or disability	772	4.72	0.54
Presents self in a professional manner	772	4.66	0.61
Demonstrates empathy	770	4.57	0.64
Is respectful to coworkers	774	4.67	0.64
Is approachable	772	4.68	0.66
Demonstrates appropriate concern for safety	767	4.51	0.65
Participates in identifying system errors	731	4.16	0.82
Participates in development of system solutions	727	4.13	0.83
Considers patients' socioeconomic and psychosocial needs to provide optimal patient care.	758	4.35	0.77
Uses resources efficiently	764	4.39	0.70
Is cognizant of current workloads when assigning tasks	743	4.30	0.79
Accesses resources to guide patient care	753	4.41	0.71
Teaches colleagues	753	4.33	0.77
Accepts feedback	764	4.53	0.73
Recognizes limits of expertise	580	4.45	0.70
Recognizes situations in which an urgent response is needed	765	4.60	0.64
Reassesses responses to interventions	762	4.52	0.69
Identifies pertinent physical findings based on patient complaint	762	4.55	0.63
Prioritize vital critical actions in the resuscitation of a critically ill patient	756	4.56	0.68
Effectively manages multiple tasks simultaneously	761	4.42	0.76

Cronbach's alpha (overall 0.97).

**Table 3**  
Patient Evaluator Descriptive Statistics and Internal Consistency

Items	<i>n</i>	Mean	SD
I understand what my doctor told me	2,069	4.65	0.74
My doctor introduced himself/herself	2,072	4.73	0.70
I am satisfied with how my doctor interacted with my family	1,728	4.58	0.82
I felt comfortable sharing concerns with my doctor	2,044	4.66	0.77
My doctor addressed my concerns	2,026	4.60	0.84
I trust my doctor	2,061	4.54	0.85
My doctor respected me	2,073	4.69	0.74
My doctor understood my concerns	2,053	4.61	0.83
I am confident in my doctor's ability	2,064	4.56	0.82
My doctor respected my social and financial situation while treating me	1,799	4.46	0.93
My doctor treated me in a timely manner	2,060	4.53	0.90
My doctor checked to see if my condition responded to his/her treatment	1,827	4.44	0.98

Cronbach's alpha (overall 0.96).

**Table 4**  
Self-evaluator Descriptive Statistics and Internal Consistency

Items	<i>n</i>	Mean	SD
Communicates effectively with patients	97	4.14	0.65
Introduced myself	94	4.73	0.59
Communicates effectively with other health professionals	98	4.05	0.62
Communicates effectively in critical situations	97	3.69	0.73
Establishes patient rapport	98	4.17	0.69
Works effectively in team	97	4.27	0.62
Handoffs are effective	97	3.97	0.64
Responsive to concerns raised by other team members	97	4.27	0.67
Maintains patient confidentiality	98	4.46	0.66
Demonstrates respect for others regardless of sex, ethnicity, or disability	98	4.61	0.64
Presents self in a professional manner	98	4.27	0.71
Demonstrates empathy	98	4.19	0.71
Is respectful to coworkers	97	4.55	0.63
Approachable	96	4.35	0.77
Patients trust me	82	4.15	0.72
Demonstrates appropriate concern for safety	98	4.11	0.72
Participates in identifying system errors	98	3.42	0.95
Participates in development of system solutions	98	3.17	1.03
Considers patients' socioeconomic and psychosocial needs to provide optimal patient	98	3.86	0.77
Accesses resources to guide patient care	97	4.11	0.73
Teaches colleagues	98	3.70	0.79
Accepts feedback	98	4.31	0.62
Recognizes limits of expertise	98	4.41	0.66
Patients are confident in my abilities	94	3.81	0.68
Recognizes situations in which an urgent response is needed	85	4.21	0.69
Reassesses response to interventions	85	4.00	0.76
Identifies pertinent physical findings based on patient complaint	85	4.08	0.66
Prioritize vital critical actions in the resuscitation of critically ill patient	85	3.95	0.83
Effectively manages multiple tasks	85	3.76	0.78
Identifies most likely diagnosis based on patient presentation	85	3.94	0.75

Cronbach's alpha (overall 0.96).

reproducible manner across multiple institutions and may have diminished the willingness of residents to volunteer.

## CONCLUSIONS

We found a multisource feedback system feasible, although resource-intensive, to implement in a prospective multicenter study of U.S. emergency medicine resident workplace-based assessment. Residents tended to score themselves lower than colleagues and patients did, but scored well overall. Internal consistency data provides preliminary internal structure validity evidence that may be helpful for program directors or medical student educators who wish to implement similar instruments for competency-based assessment or further study in the ED setting.

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### **Supporting Information**

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The following supporting information is available in the online version of this paper available at <http://onlinelibrary.wiley.com/doi/10.1002/aet2.10043/full>

**Data Supplement S1.** Supplementary Files S1–S4.