



## Assessing Teamwork: A Reliable Five-Question Survey

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**BACKGROUND AND OBJECTIVES:** Currently available tools to measure teamwork, an essential component of primary care, are generally very resource intensive and thus cannot be administered frequently. To explore the possibility of developing a brief teamwork-assessment instrument, we first administered 29 questions about teamwork from the Practice Environment Checklist (PEC) to all members of six clinical teams in a residency outpatient practice (n=56). We found that the scale assessed a single dimension of teamwork and that a five item survey has acceptable reliability (Cronbach alpha=0.89). In a subsequent validation study among an expanded sample of clinic staff (n=89), we found that the five-item questionnaire could be completed in less than 3 minutes. It continued to have an acceptable internal consistency (Cronbach alpha=0.82) and that all five items had sizeable item-total correlations. The resulting short form of the PEC may be useful for frequent assessment of team function.

(Fam Med 2011;43(10):731-4.)

**A**lthough teamwork is a critical component of transformational change in the primary care setting, there are few instruments that can measure teamwork in a reliable and economical way. Rather, many current instruments rely upon trained observers who focus on several different aspects of the clinical environment, including teamwork.<sup>1,2</sup>

One such instrument is the Practice Environment Checklist (PEC), a 75-item assessment tool that is completed by outside facilitators “to help (them) focus on specific organizational characteristics in their practices and that they filled out based on their impressions of the practice.” One difficulty with the instrument is that “The facilitators reported difficulty filling out the PEC, in part due to their inability

to assess the organizational features of a practice because they were not staff members.”<sup>3</sup> An alternative approach would be for team members to use these items to assess their own degree of teamwork. We assessed whether a smaller self-administered subset of items from the PEC would represent a reliable set of questions from which team members could report their assessment of team functioning. We also sought to determine the minimum number of items that would yield a reliable response from team members.

### Methods

#### *Derivation Study*

To define a smaller subset of items for analysis, we selected at least one item from each of the 18 domains of the PEC, with the goal of selecting

the smallest number of items that appeared to represent unique and non-redundant content areas. For this reason, our final set did not include items from some domains that contained fewer than three items, as we felt that these items were similar to items that appeared in other domains.

Our final set comprised 29 items, which were administered to each person on six clinical teams who work together in the outpatient setting (total n=56) in a community-based university-affiliated residency training program. Teams comprised medical assistants, clinical secretaries, nurses, nurse practitioners, front-end managers, medical residents, physician faculty, and a behavioral health professional. The surveys were administered during a weekly team meeting, with the expectation that they would require only a few minutes and that thus would be completed and collected during the meeting.

Our study was determined exempt from review by the Institutional Review Board at the University of Rochester.

**Statistical Analysis.** The 29 items were first factor analyzed by principal factors extraction, followed by varimax rotation. To determine the

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appropriate number of factors, we considered several criteria, including absolute values of the eigenvalues, the shape of the scree plots, and the degree to which various solutions yielded interpretable factor descriptions and simple structure. We then computed Cronbach alpha values for the resulting subscale(s). Finally, we computed the projected reliability of the short version of the scale(s) by computing Cronbach alpha values for shorter scales composed of items with the highest item-total correlations. We also used the Spearman-Brown formula to compute projected reliabilities for randomly chosen items from the subscale(s). All

analyses were performed with SAS version 9.2 (Cary, NC).

#### *Validation Study*

A five-item survey was produced from the derivation study. We administered this version of the PEC to a larger sample (n=89) of team members at subsequent team meeting in February 2011. We computed the Cronbach alpha for the scale, as well as the individual item-total correlations.

### **Results**

#### *Derivation Study*

**Factor Analysis.** Factor analysis of the 29 items yielded a first factor with an eigenvalue of 12.0, which

accounted for 41% of the variance in the correlation matrix. There were six additional factors with eigenvalues between 1 and 2.1, which collectively accounted for an additional 30% of the variance. We examined a number of rotated factor solutions for various numbers of factors between 2 and 7—none of these had simple structure, with several variables having substantive loadings on more than 1 factor. We thus concluded that a single-factor solution was a best fit for the data. Factor loadings are shown in Table 1.

**Scale Reliability.** The overall 29-item scale had a Cronbach alpha of 0.94. Of the 29 items, 24 had

**Table 1: Subset of 29 Items From the Practice Environment Survey**

Item Text	Factor Loading	Item-Total Correlation (Derivation Study)	Item-Total Correlation (Validation Study)
1. People in this team actively seek new ways to improve how they do things.	0.66	0.62	
2. People at all levels of this team openly talk about what is and isn't working.	0.65	0.58	
3. Opinions are valued by others in this team.	0.71	0.69	
<b>4. This team encourages everyone to share ideas.</b>	<b>0.80</b>	<b>0.76</b>	<b>0.58</b>
5. People in this team can rely on others to do their jobs well.	0.75	0.72	
6. People in this team regularly take time to reflect on how they do things.	0.71	0.65	
7. After trying something new, people in this team take time to think about how it worked.	0.66	0.62	
8. The leadership in this team is available for consultation on problems.	0.76	0.66	
<b>9. Leadership in this team creates an environment where things can be accomplished.</b>	<b>0.77</b>	<b>0.76</b>	<b>0.67</b>
10. This team learns from its mistakes.	0.74	0.68	
11. This team tends to be flexible.	0.67	0.64	
<b>12. People in this team have the information that they need to do their jobs well.</b>	<b>0.87</b>	<b>0.81</b>	<b>0.42</b>
<b>13. When people in this team experience a problem, they make a serious effort to figure out what's really going on.</b>	<b>0.77</b>	<b>0.74</b>	<b>0.78</b>

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Table 1: Continued

Item Text	Factor Loading	Item-Total Correlation (Derivation Study)	Item-Total Correlation (Validation Study)
14. Most of the people who work in this team seem to enjoy their work.	0.62	0.62	
15. Working in this team is stressful.	-0.31	-0.32	
16. Work expectations are clear.	0.57	0.54	
17. People have what they need to do their work well.	0.62	0.61	
18. People receive frequent and helpful feedback about their work.	0.59	0.54	
19. People in this team are connected with community organizations that serve patients.	0.42	0.37	
20. People in this team are comfortable caring for patients from culturally diverse backgrounds.	0.39	0.37	
21. People in this team believe this team provides culturally sensitive care.	0.34	0.32	
22. People in this team openly discuss errors that happen in the team.	0.65	0.60	
23. Everyone in this team has access to the information they need for patient care and their work when they need it.	0.68	0.57	
24. This team and its clinicians give the attention that patients feel they need for spiritual health and well-being.	0.52	0.50	
25. This team has a clear, expressible vision.	0.70	0.64	
26. There is frequent and good communication throughout the team about how the different change initiatives are going.	0.75	0.72	
<b>27. Everyone in the team feels able to act on the team vision.</b>	<b>0.76</b>	<b>0.74</b>	<b>0.80</b>
28. The team appears to let setbacks and problems stop its change efforts.	0.35	0.27	
29. Once this team implements a change, the change tends to stick.	0.60	0.55	

The five items with the highest item-total correlations from the derivation study are indicated in bold.

item-total correlations of 0.5 or higher, and 18 had item-total correlations of 0.6 or higher. A subscale composed of the five items with the highest item-total correlation would have a Cronbach alpha of 0.89. Using the Spearman-Brown formula, we find that a scale comprising any four randomly chosen items from this scale would have a projected Cronbach

alpha of 0.61; a scale comprising six randomly chosen items would have a projected Cronbach alpha of 0.70.

#### *Validation Study*

The 5-item scale had a Cronbach alpha of 0.84. The individual item-total correlations ranged between 0.42 and 0.80.

#### **Discussion**

We find that the items of the full 29-item PEC all appear to relate to a unidimensional underlying psychological factor, which represents team members' general views of their team's effectiveness. This dimension appears to be highly reliable, such that asking as few as five of these questions can yield reliable

estimates of people's underlying views of team effectiveness. In our follow-up validation study, we found that the five-item version continues to have a high internal consistency. In the validation study, we found that respondents could complete the five-item version in 3 minutes or less.

Although teamwork has been recognized in the inpatient setting as a way to improve patient safety,<sup>1,2,4</sup> there is not currently an economical and reliable scale on which to assess team members' views on the quality of their teamwork.

While we recognize that teamwork is not an end in itself, it is presumed to be on the causal pathway to avoiding errors and therefore improved patient outcomes. Thus, it is important to measure teamwork-related interventions in ways that are not overly burdensome for staff, nor costly to administer. Our version of the PEC instrument, the Teamwork Mini-PEC, accomplishes that.

We recognize several limitations of our study. First, it was conducted at a single program and thus will

need to be replicated in other clinical settings to ensure that the structure of the simple 5-item survey is stable across settings. Second, our derivation study had a relatively low sample size, with only two respondents per item. We point out, however, that we found a compelling single-factor solution, and we are not making claims about more complex (and possibly more unstable) factor structures. Further, our single-factor solution was convincingly replicated in the validation study. Third, we recognize that our study does not establish the validity of the short scale, as we do not have contemporaneous data that would correlate with our measures. Like all self-report instruments, this short scale may be subject to several reporting biases. Nonetheless, the first requirement of a measurement tool is that it is feasible and reliable. We believe that we have demonstrated those qualities for our brief scale. This work sets the stage for future studies to assess how this scale relates to other important team-related variables.

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