'BAREFOOT DOCTORS' IN RURAL GEORGIA: THE EFFECT OF PEER SELECTION ON THE PERFORMANCE OF TRAINED VOLUNTEERS

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Abstract—Does volunteer selection by peers have a measurable effect on volunteer performance? This paper examines this question in the context of a field experiment which used community organizations as a means to select people to serve as Emergency Medical Coordinators (EMCs). Field sites were 36 rural Georgia communities with populations ranging from 150 to 1850. EMCs were trained in a 40 hour program as first responders to emergency incidents and as organizers of an emergency response system within their communities. Their performance in each of these roles was assessed by composite measures (a first aid performance index and an activity index) developed as part of the study. Each sponsor organization conducted the selection of EMCs for their respective communities. The process was monitored and assessed as either comprehensive, including the evaluation and elimination of candidates, or as unstructured where interested individuals self-volunteered. Performance scores were regressed on the selection process variable as well as a set of structural, predisposing and enabling variables. Peer selection was a statistically significant predictor of EMC performance as a first responder but not as a response system organizer. Implications of this result as well as the influence of other independent variables are discussed.

INTRODUCTION

Access to emergency care has presented a compounding set of problems for rural communities because of the increased importance of time in receiving medical attention and the relatively more hazardous work environments rural residents experience [1]. Federal attention to these problems began in the area of emergency medical care with the passage of the Emergency Medical Service System Act (P.L. 93-154) in 1973. Resources for developing and upgrading statewide emergency care response systems were made available and a substantial amount of research on rural emergency medical services (EMS) has been conducted [2, 3].

Despite this activity, access to care problems have persisted for communities which are characterized by a particularly intractable set of circumstances: very small (less than 800) populations, relatively isolated locations and a lack of resources necessary to support an ambulance service even if one was available. Furthermore, the incidence of serious trauma in these communities is infrequent making it difficult for trained persons to retain emergency care skills at the level ambulance personnel are required to perform. It goes without saying that these communities are unable to attract resident physicians.

This paper describes the evaluation of volunteer performance in a field study which introduced the concept of a community-selected volunteer, trained as a first responder, who would provide the critical link between these small, isolated, medically underserved communities and the existing EMS system.

Referred to as Emergency Medical Coordinators (EMCs), these individuals were volunteers in the sense they received no financial compensation for their efforts.

The EMCs filled several roles. First was that of a first responder. This included providing first aid and stabilization procedures to emergency victims. Second was that of a community organizer. Residents needed to know not only whom to call when an emergency incident occurred but be willing to trust and use the EMC. As a local resident, it was reasoned, the EMC would know the community, could respond rapidly to a call when time was critical and stabilize the victim until an ambulance arrived, often a 30 to 45 minute wait under existing circumstances. The response system was created through the distribution of telephone stickers which had both the EMC's name and number and that of the closest ambulance service. Residents were instructed to first call the ambulance service and then to call their EMC.

A third EMC role was that of a program publicist and educator who kept residents aware of appropriate action to take in an emergency, who emphasized personal awareness of preventive health behaviors and who kept the program visible despite the infrequence of trauma incidents, however serious. A slide-tape program and other visual aids were developed for use by EMCs in speaking to local organizations about the EMC program. First aid equipment, purchased for EMCs, was available to conduct blood pressure checks of residents at local functions.

Models using local residents as physician extenders as a means to address the lack of adequate health manpower in rural areas exist. Most notable of these are the 'barefoot doctors' of the People's Republic of

China [4]. Such persons receive medical training but are also workers with full-time jobs in the community. People who serve in this role are frequently designated by fellow residents because of their interest and because they hold the trust and respect of community members.

In a similar fashion, the EMC project sought to identify individuals who informally filled the role of substitute medical provider in the absence of a community physician or other trained person. It was felt that this could best be accomplished by using local community organizations as a means to make informed decisions about the most appropriate persons to serve as EMCs. Further, a locally-based selection process by peers would lend prestige to the EMC position and support the continued functioning of the program in the long-term. Evaluation of EMC performance was designed to examine the process of selection as a key independent variable.

METHODOLOGY

The project used 36 communities in north-central Georgia as field sites. These communities were randomly selected from a pool of communities which had no resident physician nor ambulance service, which had populations between 150 and 1850 persons and which were outside suburban areas surrounding major metropolitan centers. Local organizations were identified in each community which were willing to serve as sponsors and to organize the selection of two residents who would serve as EMCs. These included city councils, PTAs and other civic and church-based groups. Sponsors were provided with a set of eight criteria with which to use as a guide in EMC selection. They were: (1) access to a private telephone; (2) access to a car; (3) good physical condition; (4) positive attitude about being an EMC; (5) residence in the community; (6) work location in the community; (7) competency to learn skills; and (8) respected by community residents. Sixty-eight residents were selected*.

Field site communities were monitored throughout the EMC selection process by a project staff member responsible for organizing specific communities. This included attending local community meetings in which the project was discussed and keeping telephone contact with sponsor groups to answer questions, provide encouragement and solicit information on the selection process. Diaries were used by the organizing staff to describe the process of contact with each community. From the diaries, a rating was developed which described the degree of sponsor group involvement and the comprehensiveness with which candidates were considered for the EMC position. In some communities, a formalized process of publicizing the position, interviewing candidates and voting to make a final selection occurred. In others, community residents self-volunteered.

Once identified, EMCs were asked to complete a biographical questionnaire which, along with a number of socio-demographic items, requested EMCs to

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*Thirty towns selected 2 EMCs, 5 towns selected 1 EMC and 1 town selected 3 EMCs.

describe the process by which they were chosen. These responses were coded according to the presence/absence of some process of elimination in selecting volunteers. The process was confirmed by observations of the respective project staff member and sponsor group ratings.

EMCs were then trained as a group in a 40 hour program modeled after the U.S. Department of Transportation's Crash Injury Management course. This course was supplemented by material and information concerned with the health educator, system-organizer role envisioned for the EMC. Each volunteer was supplied with a first aid kit the cost of which was shared between community sponsors and project funds.

The EMC's performance was measured by two composite variables. One, a first aid performance index, was developed from self-administered incident report forms which EMCs completed after each emergency call. The index used in the ratio of a weighted set of first aid procedures performed to a weighted set of procedures required based on the condition or conditions of the emergency victim [5]. EMCs were scored on a scale of 0–100 for each incident and scores were averaged for all incidents reported.

During the 22 months of project monitoring, EMCs received 736 calls, 263 of which required emergency transportation to the hospital. This is approximately 11 calls per volunteer and illustrates the low frequency of incidents in very small communities. Implications of this frequency level on first responder performance are discussed in the Discussion section.

The second performance measure was an activity index which reflected the number and types of activities EMCs performed in the role of emergency health educator and system organizer. Scores were developed by summing a weighted count of activities in four areas: community publicity, telephone sticker distribution, attendance at refresher training sessions at 6 month intervals following initial training and local emergency medical training activities which allowed EMCs to increase knowledge and skills beyond those provided by the project and encouraged the formation of good working relationships with local medical professionals. Final index scores were calculated on a 0–100 point scale [6].

The performance measures were analyzed according to the process of EMC selection and a related set of independent variables. These included two variables measuring the EMC's attitude toward the worthiness of the project and his/her personal interest and commitment to it. They were constructed from a factor analysis of responses to 35 statements comprising an attitude survey conducted as part of the initial training program [6]. The analysis identified 11 statements associated with project worth and 6 statements associated with personal interest in the project. Statements were scaled from '1'—strongly agree to '5'—strongly disagree. The method of summated ratings was used to develop scores for each set of statements. A low score reflected a more positive attitude with scales reversed for negatively stated items.

Other independent variables were a set of struc-

characteristics which described the community, viz., the distance to the closest ambulance and the degree of sponsor group activity. It was hypothesized that smaller, more cohesive communities might be more receptive to the program and more knowledgeable about appropriate persons to fill the EMC function. Likewise, communities at greater distances from ambulance services might perceive a greater need for the EMC and be more receptive to the program. In addition, it was reasoned that an active sponsor group would be supportive of EMC organizer-educator activities and thus influence EMC performance in these areas. Sponsor group ratings ranged from '1'—high activity level to '5'—low activity level.

Two additional sets of variables were also included. Age and sex (referred to as predisposing characteristics) were used to assess positions of respect and authority held by EMC. Education, length of residence, the number of memberhips in local organizations, the distance of both residence and work locations from the town center and the number of hours per day routinely spent away from town (referred to as enabling characteristics) were used to assess the influence of an EMC's knowledge of the community and his/her availability to its residents on performance. The number of calls received per EMC was also included in the independent variable set as a measure of community awareness of the program.

The effect of the selection process on EMC performance was analyzed using correlation analysis and multiple regression analysis. Dummy variables were constructed for the two nominal level variables in the data set, 'selection process' (1 = selection by a process of elimination, 0 = self-volunteer) and 'sex' (1 = male, 0 = female). Zero and first order partial correlations were determined for the first aid performance index score and the selection process and for the activity index score and the selection process controlling for the set of attitudinal, structural, predisposing and enabling independent variables described previously.

Finally, activity and first aid performance scores were regressed on the entire set of independent variables including selection process. Using a standard regression method, independent variables were entered into the equation in one step and the F ratio statistic was employed as a test of significance for individual regression coefficients. A stepwise regression was then performed with independent variables entered in an order determined by the greatest incremental increase in percent variance explained. The process was stopped when the F statistic calculated for each independent variable inclusion was not statistically significant at the 95% confidence interval.

RESULTS

The selection process is significantly correlated with both performance measures according to the data. Those EMCs who were selected by some process of elimination scored higher on both the activity and first aid performance indexes. Table 1 exhibits intercorrelation coefficients for all variables in the data set.

The direction of association between performance and independent variables is that generally anticipated with several exceptions. While education is positively related to first aid performance, it is negatively associated with the activity score. Length of residence in the community is negatively correlated with both performance measures. Active sponsor groups were associated with EMCs with higher activity scores but with lower first aid performance scores. In each of these cases, however, the correlation coefficients were not significantly different from zero (one-tailed t-test, $P > 0.05$). Women were higher scorers than men on both performance measures (activity score: women = 63.3, men = 51.7; first aid performance score: women = 38.0, men = 32.8) with statistically significant correlation coefficients for activity scores (one-tailed t-test, $P < 0.05$). Positive attitudes toward both project and personal interest were associated with higher performance scores, with correlations for activity scores statistically significant ($P < 0.01$). This was true as well for EMCs receiving a larger number of calls with activity score correlation significant at $P < 0.05$ and first aid performance score significant at $P < 0.01$ levels.

First order partial correlation coefficients were calculated for activity score and selection process and first aid performance score and selection process controlling for each independent variable. The coefficients remained statistically significant at $P < 0.05$ for activity score vs selection process in each case. First aid performance score vs selection process coefficients remained significant at $P < 0.01$ with the exception of attitude scores and sex as controls. In these cases the partial correlation coefficients for first aid performance score vs selection process were statistically significant at $P < 0.05$.

Table 2 shows regression coefficients obtained by regressing each performance measure on the entire set of independent variables. The F ratio statistic for the total equation for each performance measure is statistically significant ($P < 0.05$, activity score: $P < 0.01$, first aid performance score). The partial regression coefficient for selection process was statistically significant for first aid performance score ($P < 0.01$) but not for activity score. The set of independent variables explained 40% of the variance in activity score and 51% of the variance in first aid performance score.

Table 3 exhibits partial regression coefficients determined by stepwise inclusion. With an F ratio statistic significant at $P < 0.05$ as a minimum inclusion criterion, 4 variables (number of calls per EMC, personal interest, age and length of residence) explained 29% of the variance in activity score. Three variables (number of calls per EMC, selection process and education) explained 42% of the variance in first aid performance score.

DISCUSSION

For men and women serving as EMCs in this project, selection by community peers had a positive impact on and was a significant predictor of their performance as first responders. While high personal interest in the project is a good indicator of successfully filling the organizer-educator dimension of the EMC role, it is not a major contributor to predicting

Table 1. Zero order correlation coefficients, means and standard deviations of

Variable	1	2	3	4	5	6	7	8
1. Activity score	1.00							
2. First aid performance score	0.35	1.00						
3. Selection process	0.25*	0.28**	1.00					
4. Attitude: worth of project	−0.33**	−0.16	−0.15	1.00				
5. Attitude: personal interest	−0.34**	−0.08	−0.13	0.73**	1.00			
6. Education	−0.07	0.11	−0.16	−0.06	−0.03	1.00		
7. Length of residence	−0.20	−0.02	−0.15	−0.15	−0.09	−0.08	1.00	
8. No. of memberships in organizations	0.02	−0.06	0.00	−0.15	0.00	0.10	0.11	1.00
9. Distance of residence from town	0.03	−0.06	−0.17	−0.12	−0.03	0.04	0.01	−0.25*
10. Distance of work location from town	0.16	−0.02	−0.18	−0.15	−0.10	−0.06	−0.08	0.07
11. Hours/day away from home	−0.05	−0.10	−0.04	0.21*	0.09	0.03	−0.26*	0.06
12. Sex	−0.20*	−0.07	−0.17	0.12	0.20*	0.06	0.02	0.07
13. Age	0.03	−0.16	0.08	−0.11	−0.06	−0.22*	0.51**	0.33**
14. No. of calls received per EMC	0.24*	0.54**	0.02	−0.05	0.11	−0.12	0.08	−0.04
15. Town size (population)	−0.01	0.03	0.16	0.21*	0.13	−0.08	0.02	0.12
16. Distance to nearest ambulance	−0.17	0.03	−0.32**	0.09	0.26**	−0.05	−0.11	−0.11
17. Sponsor group rating	−0.10	0.09	−0.01	0.15	−0.03	0.04	−0.01	0.04

*P < 0.05; **P < 0.01.

first responder performance. The data suggest that peer selection is important and that it represents a means for making informed decisions about the most appropriate community members for the EMC position. Although peer selection is not as important to predicting organizer-educator performance, it is significantly correlated. Its contribution is, no doubt,

more complex as is the organizer-educator dimension of the EMC role. Thus, simple solicitation of volunteers to serve as EMCs might provide active system organizers and sources of program publicity but not necessarily the best first responders.

The number of emergency-related calls received was also a significant predictor of high performance

Table 2. Regression of performance measures on selection process and related independent variables

Variable	Activity score	First aid performance score
Selection process	0.08	0.38**
Attitude: worth of project	−0.09	−0.05
Attitude: personal interest	−0.21	−0.08
Education	0.04	0.24*
Length of residence	−0.40**	0.05
No. of memberships in organizations	−0.09	−0.08
Distance of residence from town	−0.03	−0.04
Distance of work location from town	0.26	0.19
Hours/day away from town	0.03	−0.06
Sex	−0.11	0.11
Age	0.33*	−0.08
No. of calls received per EMC	0.38**	0.59**
Town size (population)	−0.05	0.04
Distance to nearest ambulance	−0.21	0.12
Sponsor group rating	−0.06	0.21
R^2	0.40	0.51
F ratio test for equation	2.17*	3.28***
d.f.	15,48	15,48

*P < 0.05; **P < 0.01; ***P < 0.001.

Table 3. Stepwise regression of performance measures on selected variables

Variable	Activity score	First aid performance score
Attitude: personal interest	−0.39	
Length of residence	−0.37	
Age	0.22	
No. of calls received per EMC	0.33	0.56
Selection process		0.30
Education		0.23
R^2	0.29	0.42
F ratio test for equation	6.11	14.32
d.f.	4,59	3,60
P	0.0004	0.0001

performance measures, selection process and related independent variables

	10	11	12	13	14	15	16	17	Mean	SD
									57.03	25.25
									35.36	32.99
									0.66	0.48
									16.03	3.42
									10.50	2.79
									12.59	2.03
									17.06	15.17
									1.83	1.77
	1.00								1.28	1.50
	0.33**	1.00							29.06	40.32
	−0.16	0.11	1.00						5.16	4.20
	−0.12	−0.18	0.30**	1.00					0.61	0.49
	−0.14	−0.26*	−0.31**	0.08	1.00				35.31	9.37
	0.01	−0.16	−0.11	−0.03	−0.07	1.00			3.98	5.93
	−0.23*	−0.03	−0.08	−0.29**	0.11	0.01	1.00		418.23	306.09
	0.19	0.12	−0.05	0.03	−0.09	0.16	−0.12	1.00	10.64	3.85
	−0.33**	−0.16	0.01	−0.08	−0.01	−0.12	0.07	−0.23*	1.00	2.30	1.09

scores on both indexes. One explanation of this outcome associates calls with high esteem and respect for the EMC who has earned this by high level performance. Further interpretation of these associations is complicated by intercommunity variability in the occurrence of emergency incidents; by a 'practice effect', i.e. the more emergency episodes responded to, the more chances exist to practice skills which result in higher first responder performance; and by variability in the spread of information about the program and whom to contact.

The chance for the EMC to practice first aid skills is constrained by the generally low frequency of emergency incidents. Thus first responder performance scores must be interpreted with some caution. On the other hand, the types of skills a first responder has are specifically those which are relatively simple and designed to stabilize the victim until more highly trained help arrives. Thus frequent practice is of less importance to performance on the whole as compared with more technically trained personnel. In addition, EMCs received periodic retraining sessions at 6 month intervals which provided supervised practice experience.

Education and age are both positively associated performance predictors for first responder and organizer-educator roles respectively. The median level of education for the group was 12.6 years. Twelve EMCs (18.5%) had not finished high school. Two of the twelve were presently high school students at the time of data collection. Nine (13.8%) were college graduates. No minimum level of education was specified as part of the project design other than that required to master cognitive skills in the first responder training sessions. Thus, while education appears to be an important indicator of performance, the data do not allow any definitive evaluation of what the optimum level might be. Similar comments can be made about age. The median for the group was 35 years with a range from 17 to 59. Age was a positive predictor of organizer-educator performance only, suggesting that physical conditioning rather than chronological age might be a more important criterion of first responder performance.

Finally, length of residence is negatively associated with a high activity score. It was initially hypothesized that a long time resident would better fit the EMC role, because s/he was more knowledgeable about the community and its residents. Median length of residence was 10 years with a range of 1–57 years. Nineteen EMCs (29%) resided less than 5 years in their respective towns. Interpretation of this variable as a predictor of performance is complicated by a relatively high and statistically significant $(P < 0.01)$ intercorrelation coefficient with age suggesting multicollinearity effects. Further analysis of this effect is beyond the scope of this paper.

CONCLUSION

Data support the notion that a selection process, managed and controlled by a local organization and which involves screening and eliminating candidates, makes a positive impact on the kind of volunteer selected in terms of his/her performance as a first responder. It is not a statistically significant predictor of performance as a system organizer-emergency health prevention educator, however. The latter appears to be more a function of the volunteer's attitude toward personal interest in the program.

This outcome has implications for project implementation functions carried out by regional EMS staff, agricultural extension workers or similar persons if the project is organized on a statewide, EMS system level. Research staff found it possible to identify local community groups as sponsors and get them started with the selection task with two or three visits per community. The relatively small populations of these communities facilitated the process. In contrast with simply putting out a call for people willing to serve as EMCs, results from this project suggest that the additional time invested in organizing a local selection process may be well worth it.

Overall acceptance of this program by communities was evaluated by assessing community awareness of and attitudes toward using a first responder through use of a household telephone survey before

and after project initiation. A comparably selected group of 25 control communities were used as a basis for comparison. Willingness to use a first responder system was greater for EMC communities than for controls after introduction of the program [7]. Response time to the accident scene was reduced from an average of 20 to 4.4 minutes. At least 10 life-threatening cases were documented in which the intervention of the EMC made a positive difference on stabilizing the victim and keeping him/her alive until advanced care could be applied. The community-selected volunteer appears to be a successful means to address emergency care access problems which can operate within the limited resources of very small communities.

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