4-10-2013

There is no “I” in TEAM: Players, Leaders, and Team Performance in Public Health Emergency Response

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There is no “I” in TEAM: Players, Leaders, and Team Performance in Public Health Emergency Response

University of Minnesota: Simulations, Exercises and Effective Education (U-SEEE) Preparedness and Emergency Response Research Center (PERRC)

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MN Dept of Health: Mickey Scullard, MPH, MEP; Cheryl Petersen-Kroeber, BS, MEP
Georgia Southern University: Gulzar Shah, PhD, MStat, MS

2013 PHSSR Keeneland Conference
University of Minnesota: Simulations, Exercises, and Effective Education Preparedness and Emergency Response Research Center and Learning Centers (U-SEEE PERRC & PERL) are supported, in part, by grants/cooperative agreements (5P01TP0000301-04 and 5U90TP000418-02) from the Centers for Disease Control & Prevention (CDC). The content is the sole responsibility of the authors and does not necessarily represent the official views of the CDC.
Outline

• Research Objectives
• Data Sets & Sources
• Study Design
• Analysis
• Principal Findings
• Conclusions
• Implications
Research Objectives

1) Assess effect of controller-led in situ simulation on emergency response capacity of the state health department

2) Study effects of training on team function, dynamics, and communications among staff responsible for emergency operations

3) Train public health teams for high reliability
Data Sets & Sources

- Thirty (30) trials (1-hr functional exercises) conducted in state department operations center in a 16-mo period (May 2010-Sep 2011)

- Data gathered using *in situ* simulation methodology: recordings, live viewing, playback analysis
  - Behavioral markers data gathered using event set observational tool (24 recordings analyzed)
  - Decision-making data collected using decision taxonomy tool (22 recordings analyzed)
Study Design

- Quasi-experimental intervention with time-series analysis and comparison group
  - Measured team performance in public health preparedness context;
  - Examined impact of intervention to achieve high reliability in emergency operations center; and
  - Looked at relationship among behavioral markers, decision-making, and team performance
Study Design

MDH Pool of Response Staff
n = 77

Staff activated only when response needs dictate n = 17 or more (dependent on incident)

NOT INCLUDED IN STUDY

Staff not included on research teams
n = 21

NOT INCLUDED IN STUDY

Staff randomized into 3 research teams: comparison, didactic, treatment
n = 17 per team x 3 teams = 51 + 6 substitute = 57 total

Comparison Group
n = 17
“Training as usual”: 10 trials per MDH training/exercise protocol, (based on HSEEP)

Didactic Only Group
n = 17
Team dynamics didactic training + 10 trials per MDH protocol

Treatment Group
n = 17
Team dynamics didactic training + 10 trials + facilitated debrief in situ

** All trials (n=30) performed in real work setting (in situ); all trials recorded for live viewing and playback analysis
Participant Characteristics

<table>
<thead>
<tr>
<th>Highest education attained?</th>
<th>Tech</th>
<th>Bachelor's</th>
<th>Master's</th>
<th>Doctorate</th>
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<tr>
<td>Yes</td>
<td>2%</td>
<td>34%</td>
<td>53%</td>
<td>11%</td>
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<table>
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<th>Primary work experience in PH?</th>
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<th>No</th>
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<td>Yes</td>
<td>66%</td>
<td>31%</td>
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<tr>
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<th>Supervisor (past and/or present)?</th>
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<th>No</th>
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<td>66%</td>
<td>30%</td>
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<tr>
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<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
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<tr>
<td></td>
<td>63%</td>
<td>36%</td>
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</table>

Average years in public health = 15.6 yrs; Average years at MDH = 12 yrs
Analysis

- Examined frequency and distribution of behavioral markers (non-technical skills) to identify and describe relationship among behavioral markers, leaders, and team effectiveness/performance

- Statistical analyses:
  - Scatterplot to show association
  - Analysis of Variance (to compare means)
  - Correlation– Spearmans Rho (to show bivariate association between behavioral performance components)
  - Chi-square
PRINCIPAL FINDINGS
Phases of Team (Re)-Formation

**Phase 1**
Introduction

- Single Leader
  Incident Manager
- Single Group
  Team A

**Phase 2**
Briefing

- Shared Leader
  IM+
  Planning Chief
- Single Group
  Team B

**Phase 3**
Active Response

- Multiple Leaders
  Section Chiefs
- Sub Groups
  Team C

**Phase 4**
Check-In

- Single Leader
  Incident Manager
- Single Group
  Team A

*IM engages Planning Chief in facilitation of initial meeting*

*Time period until next check-in stated; Members break into visible sub-groups*

*Team members reconvene as single group for check-in*
What is the association b/t Exercise Participation & Team Performance?

• Team participation score (independent variable) a composite measure of individual position scores; scored on 0-3 scale:
  3  Filled by assigned player
  2  Filled by re-assigned player
  1  Filled by player with multiple (>1) positions
  0  Empty

• Performance (dependent variable) is the total team score for each phase
  – Phase score is a composite of the scores for each of the behavioral categories: Situational Awareness, Shared Mental Model, Standardized Communication, Leadership

• Hypothesis: higher scores for participation associated with better performance
Figure 1. Scatter plot of participation score and average performance Phase 1 all teams
Figure 2. Scatter plot of participation score and average performance Phase 2 all teams
Figure 3. Scatter plot of participation score and average performance Phase 3 all teams
Figure 4. Mean Performance Scores by Level of Participation, All Phases, All Teams

Note: Based on ANOVA test, differences in average performance score are statistically Significant at p=0.05
What is the association between Leadership & Team Performance?

A leader is physically present and performs three specific tasks:

1. prioritizes decisions,
2. coordinates activities, and
3. communicates a shared mental model

• Leadership score (independent variable) a measure of how frequently the Incident Manager exhibited specific “leader” behaviors; scored on 0-2 scale

  - 2 Behavior observed 91% to 100% of the time
  - 1 Behavior observed 50% to 90% of the time
  - 0 Behavior observed less than 50% of the time (0-49%)

  “Percent of the time” = proportion of times the behavior was observed to occur in relation to the number of times the behavior should have occurred
  Behaviors that either did or did not happen were scored as either “0” for “no” or “2” for “yes”

• Performance (dependent variable) is the total team score for each of the behavioral categories: Situational Awareness, Shared Mental Model, Standardized Communication

• Hypothesis: a more highly-performing (“skilled”) leader associated with higher team performance
Figure 5: Mean performance score for situational awareness by leadership performance

ANOVA

p<0.000; difference in mean performance is significant

ANOVA Table

<table>
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<tr>
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<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>Situational Awareness * Leadership_grouped2</td>
<td>Between Groups (Combined)</td>
<td>171.821</td>
<td>3</td>
<td>57.274</td>
<td>15.764</td>
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<td></td>
<td>Within Groups</td>
<td>243.418</td>
<td>67</td>
<td>3.633</td>
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<tr>
<td></td>
<td>Total</td>
<td>415.239</td>
<td>70</td>
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</table>
Figure 6: Mean performance score for shared mental model by leadership performance

ANOVA p<0.022; difference in mean performance is significant

<table>
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<th>Mean Square</th>
<th>F</th>
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</thead>
<tbody>
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<tr>
<td>Within Groups</td>
<td>204.163</td>
<td>67</td>
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<tr>
<td>Total</td>
<td>235.493</td>
<td>70</td>
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</table>

ANOVA Table

**Mean Performance score for Leadership**

- Score=0: 2.89
- Score=1-2: 2.83
- Score=3-4: 3.94
- Score=5+: 2.06
## Association Between Behavioral Components
(Spearman’s Rho Correlation Coefficient)

<table>
<thead>
<tr>
<th></th>
<th>Situational Awareness</th>
<th>Shared Mental Model</th>
<th>Standard Communication</th>
<th>Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation Coefficient</strong></td>
<td>1.000</td>
<td>.179</td>
<td>.314**</td>
<td>.563**</td>
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<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>1.000</td>
<td>.135</td>
<td>0.008</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
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<tr>
<td><strong>Correlation Coefficient</strong></td>
<td>.179</td>
<td>1.000</td>
<td>.248*</td>
<td>-0.086</td>
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<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.135</td>
<td>.037</td>
<td>.475</td>
<td>.788</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>71</td>
<td>71</td>
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<td><strong>Correlation Coefficient</strong></td>
<td>.314**</td>
<td>.248*</td>
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<td>-0.033</td>
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<td><strong>Sig. (2-tailed)</strong></td>
<td>0.008</td>
<td>.037</td>
<td>.788</td>
<td>.888</td>
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<td><strong>N</strong></td>
<td>71</td>
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<td><strong>Correlation Coefficient</strong></td>
<td>.563**</td>
<td>-0.086</td>
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<td>71</td>
<td>71</td>
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</table>

**. Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed).
Conclusions

• Reassignment of players, encumbering players with multiple roles, or leaving roles empty brings down team performance scores

• Team performance dependent to a certain degree on who the leader is during the exercise

• Important to understand how non-technical skills, behavioral markers, and leadership interact with and impact performance and, thus high reliability
Implications for the Field

• Findings suggest that…
  – the intervention may be less important than who the leader is and the training, preparation, and experience that leader has going into the exercise/response.

• There has been no study of leaders at the micro-system level with respect to the essential behavioral markers necessary to achieve high reliability teams in crisis management settings. Our data and findings provide some insight into that process.
Thank you!

- Additional contributors to this research and presentation:
  - Jane Braun, MPH, CEM; Minnesota Department of Health
  - Samantha Morgan, MPH; NAACHO (former CDC Prevention Specialist)
  - Nilam Patel; Georgia Southern University
  - Julia Kleingarn, MPH; U of M School of Public Health

These activities are sponsored by University of Minnesota: Simulations and Exercises for Educational Effectiveness (U-SEEE) Preparedness and Emergency Response Research Center (PERRC), supported in part through a grant from the Centers for Disease Control and Prevention (CDC)/OPHR, Grant Number 5P01TP000301-03. The contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC. Project Lead Investigator: William Riley. U-SEEE Principal Investigator: Debra K. Olson.