

## Original Research

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# Team Dynamics and Nontechnical Skills Perception During the Disaster Response in Mozambique in 2019: A Survey Study Among the Italian Emergency Medical Team

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## Abstract

**Objective:** Team dynamics and nontechnical skills in general are crucial for emergency medical teams (EMT). No study has ever examined these important issues during a real mission in the field. This study aimed to better investigate team dynamics and nontechnical skills for EMTs; it tried to understand if a real mission, when the people are obliged to work together for the first time, without a prior specific training focused on teamwork, is enough or not to work as an effective team in the field.

**Methods:** The study is designed as a pre-test/post-test survey study, and it collected data from 51 people deployed to Mozambique in 2019. Three indexes (the self-efficacy (SE), the teamwork (TW), and the overall team's performance (TW<sub>12</sub>)) were calculated as the average value of the rating given by all the participants. Open text feedback was also collected.

**Results:** A positive trend was observed comparing the “post” data to the “pre” data, but results did not show a statistical significance, with the only exception of stratified analyses showing a *P*-value less than 0.05 for SE and TW<sub>12</sub> for some categories.

**Conclusions:** According to the study findings, humanitarian workers feel good but not at their best; training programs focused on team dynamics can be really useful to improve self-confidence of people leaving for a mission.

The emergency medical teams (EMTs) “are teams of health professionals (doctors, nurses, physiotherapists, paramedics, etc.) that provide direct clinical care to people affected by emergencies and disasters, and support local health systems”.<sup>1</sup> They include governmental (both civilian and military) and nongovernmental teams and, traditionally, they establish a field hospital made up of tents to provide life-saving medical and surgical care; in addition, the response to the Ebola outbreak or to the recent coronavirus disease 2019 (COVID-19) pandemic demonstrated the great relevance they can have in other contexts, such as epidemics and complex emergencies.<sup>2,3</sup> Team dynamics, interoperability, and nontechnical skills in general are crucial for EMTs and first responders, as they must be able to coordinate their knowledge, effort, and competencies in uncertain, time-pressured situations that characterize the disaster response.

Teamwork is the ability to work effectively together<sup>4,5</sup> and, therefore, is essential to ensure safe and efficient patient care in ordinary and extraordinary contexts. The importance of teamwork is often emphasized within disaster and emergency medicine literature<sup>5–9</sup>: understanding the role of other professionals and learning how to work together are key aspects of successful disaster response.<sup>9</sup>

On a broader perspective, nontechnical skills, including teamwork, refer to a combination of cognitive and social competencies complementing knowledge and technical skills<sup>10</sup>: communication, teamwork, leadership, adaptability, conflict management, collaboration, professionalism, are essential to a successful disaster response and management.<sup>11</sup>

In 2016, Camacho and colleagues<sup>9</sup> presented the training framework for EMT, suggesting key components for an operational learning methodology. In their study, the authors highlighted the importance of a 3-steps approach where the team performance is fundamental to improve the quality of care and the patient outcomes in the field. The TEAMS project,<sup>12</sup> aiming to develop, pilot, and assess a standardized training package focused on operational team dynamics, has been created to address this specific gap in the training arena. Bodas et al.<sup>13</sup> then described the effectiveness of that specific training program to improve EMT teamwork performance.

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Nevertheless, to the best of authors' knowledge, no study has ever examined the team dynamics performance and nontechnical skills during a real mission in the field. Failures in leadership capacities and in coordination within and between teams have been identified as disaster response problems in the qualitative study performed in 2013 by Djalali *et al.*<sup>14</sup> However, until now, these concepts have been never assessed collecting data during a real disaster response. Therefore, little is known whether an EMT is able to perform as a team without a prior specific training that enhance the teamwork.

In response to this gap, a pre-test/post-test survey study was performed: data regarding team dynamics and nontechnical skills were collected during the Mozambique mission of the Emergency Medical Team Type 2 – Italy Regione Piemonte (EMT2-ITA), after the Cyclone Idai in March, 2019.<sup>15</sup> The present study aimed to better investigate team dynamics and nontechnical skills for EMTs; it tried to understand if a real mission, when the people are obliged to work together for the first time, without a prior specific training focused on teamwork, is enough or not to work as an effective team in the field.

## Methods

### Study Design

This study has been designed as a pre-test/post-test survey study without a control group. In addition to collecting data on team dynamics and nontechnical skills for the first time on the field, this type of study aims to evaluate the effect of a mission on the perception of the participants. The evaluation of the (positive or negative) change in the scoring on the post-test compared with the pre-test provides a vehicle for assessing if the impact of the situations, attitudes, interpersonal relationships, collaboration, experienced during a disaster response mission, can be sufficient to improve teamwork and nontechnical skills performances or if specific training is needed.

### Questionnaire Design

The tool validated by Bodas *et al.*<sup>13</sup> was used to measure 2 constructs, namely self-efficacy and teamwork.

In particular, the self-efficacy questionnaire measured individual perceptions of the team's ability to perform across a variety of different situations, such as achieve goals, overcome challenges, and cope with difficulties (example of question: "1. Our team will be able to achieve most of the goals that we have set for the team"); it was based on a Likert-scale ranging from 1 (strongly disagree) to 5 (strongly agree). Similarly, the teamwork questionnaire measured individual perceptions of team leadership, team dynamics, situation awareness, and task management (example of question: "1. The team leader let the team know what was expected of them through direction and command"); it was assessed using a Likert-scale ranging from 0 (never/hardly ever) to 4 (always/nearly always). In addition, item 12 of this questionnaire prompted an overall rating about the team's nontechnical performance on a scale of 1 to 10 (the question was: "12. On a scale of 1-10, give your global rating of the team's nontechnical performance"). The complete questionnaires are available as supplementary materials.

The variables of interest were the self-efficacy (SE), the teamwork (TW), and the overall team's performance item 12 (TW<sub>12</sub>) indexes, calculated as the average value of the rating given by all the participants. Finally, participants were also invited to

**Table 1.** Coding system used in the qualitative thematic analysis of open text feedback

Theme	Coding system
Adaptability	Adaptability - Flexibility - Elasticity - Mental agility - Interoperability - Versatility - Resilience
Collaboration	Collaboration - Cooperation
Communication	Communication - Dialogue - Briefing - Sharing information - Feedback
Good management	Roles - Priority - Leadership - Standard procedures - Guideline - Organization - Logistics - Achieve and share goals - Rotation with locals - To delegate - To support the team - Safety/Security
Good practice principles	Harmony - Empathy - Humility - Availability - Patience - Aid - High moral - Spirit up - Serenity - Harmony - Mutual support - Self-confidence - Working well together - Cohesion - Proactivity - Sense of belonging - Involvement - Complicity - Integration - Calm - Coordination - Respect
Personal relationships	Personal relationship - Friendship - Connection with the team
Professional competences	Professional competences - Professionalism - Technical preparation - To maintain duties

provide open text feedback, asking at least 3 things they considered important for the successful outcome of the mission (only words or short expressions allowed there).

### Data Collection

The first author (D.S.) handed out the 2 questionnaires to all the participants twice, during 2 different moments of the mission: (a) before the deploy, during the journey to Mozambique, and (b) after the deploy, during the flight back to Italy. At time (a) participants were asked to imagine what would be happening during the mission, while at time (b) participants were asked to remember what happened during the mission that just ended. The information collected at these 2 stages were considered as the "pre" and "post" data. A unique identifier (ID) was assigned to each participant to match the data to allow the cross reference of the responses without losing the anonymity. Data were collected on paper and, then, manually entered into a Microsoft Excel spreadsheet to create an electronic database.

### Data Analysis

The statistical analysis of the database was performed using Stata 15.1 (StataCorp LLC, Texas, USA). Descriptive statistics were used to present data from the questionnaires, and Wilcoxon signed-rank test was adopted to compare means of paired variables ("pre" vs "post"): a *P*-value of 0.05 or less was deemed as statistically significant.

Thematic analysis using the coding system presented in Table 1 was performed to organize and compare the information provided in the open text feedback.

### Ethical Considerations

The study protocol was submitted to the Ethics Committee at Ospedale Maggiore della Carità in Novara and obtained its review approval (document number 67/CE).

Team members were invited to participate in the study after a brief introduction regarding the study's objectives, during the pre-mission briefing.

**Table 2.** Characteristics of the study participants

		Mean (SD)
Age (y)		47.95 (9.82)
		<b>n (%)</b>
Gender	Female	26 (47.3)
	Male	29 (52.7)
Role	Doctor	20 (36.4)
	Nurse	22 (40.0)
	Midwife	1 (1.8)
	X-ray technician	1 (1.8)
	Logistic	11 (20.0)
Experience (Previous missions)	No	37 (67.3)
	Yes	18 (32.7)
ModEx	No	18 (32.7)
	Yes	37 (67.3)

Before starting to fill in the questionnaires, written informed consent was obtained from all the participants. For all subjects, it was made clear that they could withdraw from the study at any time.

## Results

### Response Rate and Demographic Characteristics

During the mission of EMT2-ITA in Mozambique,<sup>15</sup> 55 (out of 56) staff members were selected for the study (the author, D.S., being part of the staff members, was the data manager of the study). Fifty-one of them (response rate: 93%) completed both the questionnaires twice, before and after the deployment (“pre” and “post” data available): paired analyses were run using only these data. Missing data were present only in the “post” questionnaires: 3 people extended their stay in Mozambique and returned to their home country later (no possibilities to hand out the questionnaire at time (b)), whereas an additional subject did not answer during the flight back home.

Table 2 shows the characteristics of the totality of participants (55 subjects): 51% of them were male; the average age was 48 y. The team included personnel that have been deployed to a humanitarian setting at least once before the current mission (18 people; 33%), as well as novices at their first mission (37 people; 67%); 67% (37 people) of the team participated to at least 1 European Modular Exercise (ModEx) that is a 3-d full scale exercise, training the teams to work in complex and stressful contexts.

### Self-Efficacy, Teamwork, and Overall Team’s Performance Indexes

In the overall sample, of a maximum score of 5, the mean score of SE was  $4.012 \pm 0.434$  (95% confidence interval [CI]: 3.890–4.134) before the mission and  $4.162 \pm 0.655$  (95% CI: 3.977–4.346) after the deployment.

The mean score of the TW, out of a maximum of 4, was  $3.291 \pm 0.395$  (95% CI: 3.180–3.402) before the mission and  $3.334 \pm 0.480$  (95% CI: 3.199; 3.469) after the deployment.

Finally, the global rating about the team’s nontechnical performance, TW<sub>12</sub>, of a maximum of 10, was  $8.353 \pm 1.016$  (95% CI: 8.067–8.639) before the mission and  $8.549 \pm 1.154$  (95% CI: 8.224–8.874) after the deployment.

Even if all the observed differences were not statistically significant according to the Wilcoxon signed-rank test, a slight increase was recorded in all the measured scores.

Looking at stratified analyses, a significant positive change was observed for the SE ( $P$ -value = 0.004) and the TW<sub>12</sub> ( $P$ -value = 0.036) for nurses and for the TW<sub>12</sub> ( $P$ -value = 0.046) for participants older than 45 y old. In addition, a positive change “almost” significant for the SE ( $P$ -value = 0.062) and the TW ( $P$ -value = 0.056) for experienced people was noticed. On the other hand, no differences were found between other categories and between men and women. Table 3 shows the detailed results.

### Open Text Feedback

Fifty participants reported open text feedback at least once (18 people filled only “pre” data feedback, 9 people only “post” data feedback and 23 people both of them).

The most common (more than 50% of the occurrences) themes reported were “communication,” “good management,” and “good practice principles” in both “pre” and “post” data. Comparing the “post” data with the “pre” data, the trend varies according to the different themes, increasing for “good practice principles,” “personal relationships,” and “professional competencies,” and decreasing for the others. The bar chart reported in Figure 1 shows the detailed distribution of all the themes identified analyzing the open text feedback.

## Discussion

This study investigated the team dynamics and nontechnical skills inside an EMT during a disaster response mission. To the best of the authors’ knowledge, no similar data are available in scientific literature until now. Teamwork and nontechnical skills in disaster and emergency medicine have been previously thoroughly discussed: with a qualitative study, Bahrami et al.<sup>6</sup> found teamwork and communication with other team members as an essential nursing competence in disaster response; in his review, Manser,<sup>7</sup> demonstrated the critical importance of teamwork in assuring patient safety in highly dynamic domains of health-care; Baker et al.<sup>5</sup> argued that teamwork is an essential issue of reaching high reliability, especially in health-care organizations; James<sup>8</sup> reported the necessity for teams to find an effective balance between task-work and teamwork to optimally respond during a disaster; finally, in their literature review, Willems et al.<sup>10</sup> identified different nontechnical skills as essential requirements of surgeons in disaster response. Accordingly, this is the first study collecting data regarding team dynamics and nontechnical skills directly in the field, during a disaster response.

The EMT2-ITA staff is not organic, as the members work at different hospitals during their daily activity: even though this is an essential condition to avoid that entire medical departments at home being blocked for lack of personnel during a mission, it can be difficult, for people coming from different institutions with different protocols, to act as a team in a disaster setting. Moreover, this was the first mission at all for 67% of the personnel deployed in Mozambique, and only a part of them was trained to work together during full-scale exercises. In addition, nobody attended specific training regarding teamwork and nontechnical skills. Nevertheless, the indexes values were quite good, showing a moderate confidence in teamwork performance, both before and after the mission. Even though the results were not statistically significant, the positive trend observed comparing the “post” data to the “pre” data and the

**Table 3.** Main results of the study

Category (n)	Index		Mean (SD)	95% CI		P-Value
All (51)	SE	Pre	4.012 (0.434)	3.890	4.134	0.109
		Post	4.162 (0.655)	3.977	4.346	
	TW	Pre	3.291 (0.395)	3.180	3.402	0.425
		Post	3.334 (0.480)	3.199	3.469	
	TW <sub>12</sub>	Pre	8.353 (1.016)	8.067	8.639	0.268
		Post	8.549 (1.154)	8.224	8.874	
<b>Analysis by sex</b>						
Female (25)	SE	Pre	3.985 (0.349)	3.841	4.129	0.396
		Post	4.105 (0.712)	3.811	4.399	
	TW	Pre	3.397 (0.323)	3.264	3.531	0.158
		Post	3.310 (0.474)	3.114	3.506	
	TW <sub>12</sub>	Pre	8.360 (1.114)	7.900	8.820	0.571
		Post	8.600 (1.118)	8.138	9.062	
Male (26)	SE	Pre	4.038 (0.508)	3.833	4.244	0.089
		Post	4.216 (0.605)	3.972	4.461	
	TW	Pre	3.188 (0.435)	3.013	3.364	0.325
		Post	3.358 (0.494)	3.158	3.557	
	TW <sub>12</sub>	Pre	8.346 (0.936)	7.968	8.724	0.585
		Post	8.500 (1.208)	8.012	8.988	
<b>Analysis by age</b>						
Under 45 (19)	SE	Pre	3.862 (0.408)	3.665	4.059	0.468
		Post	4.007 (0.696)	3.671	4.342	
	TW	Pre	3.137 (0.362)	2.963	3.312	0.324
		Post	3.047 (0.437)	2.836	3.258	
	TW <sub>12</sub>	Pre	8.263 (0.872)	7.843	8.683	0.356
		Post	8.053 (1.268)	7.441	8.664	
Over 45 (32)	SE	Pre	4.102 (0.430)	3.947	4.257	0.126
		Post	4.254 (0.623)	4.029	4.478	
	TW	Pre	3.382 (0.390)	3.241	3.523	0.038†
		Post	3.505 (0.425)	3.352	3.658	
	TW <sub>12</sub>	Pre	8.406 (1.103)	8.009	8.804	0.046†
		Post	8.844 (0.987)	8.488	9.200	
<b>Analysis by role</b>						
Nurses (22) *	SE	Pre	4.080 (0.429)	3.889	4.270	0.004†
		Post	4.455 (0.525)	4.222	4.688	
	TW	Pre	3.370 (0.413)	3.187	3.553	0.261
		Post	3.463 (0.389)	3.290	3.635	
	TW <sub>12</sub>	Pre	8.591 (0.854)	8.212	8.970	0.036
		Post	9.182 (0.733)	8.857	9.507	
Medical doctors (20)	SE	Pre	3.881 (0.377)	3.705	4.058	0.562
		Post	3.781 (0.702)	3.453	4.110	
	TW	Pre	3.268 (0.342)	3.108	3.428	0.823
		Post	3.206 (0.535)	2.955	3.456	
	TW <sub>12</sub>	Pre	8.250 (1.164)	7.705	8.795	0.360
		Post	7.950 (1.394)	7.297	8.603	
Logisticians (9)	SE	Pre	4.139 (0.532)	3.730	4.548	0.553
		Post	4.292 (0.415)	3.973	4.610	
	TW	Pre	3.148 (0.455)	2.798	3.499	0.635
		Post	3.306 (0.526)	2.901	3.711	
	TW <sub>12</sub>	Pre	8.000 (1.000)	7.231	8.769	0.489
		Post	8.333 (0.500)	7.949	8.718	

(Continued)

Table 3. (Continued)

Category (n)	Index		Mean (SD)	95% CI		P-Value
<b>Analysis by experience</b>						
Experienced (16)	SE	Pre	4.000 (0.416)	3.778	4.222	0.062†
		Post	4.289 (0.440)	4.055	4.523	
	TW	Pre	3.187 (0.416)	2.965	3.409	0.056†
		Post	3.481 (0.462)	3.235	3.727	
	TW <sub>12</sub>	Pre	8.313 (1.014)	7.772	8.853	0.159
		Post	8.813 (0.655)	8.463	9.162	
Novice (35)	SE	Pre	4.018 (0.448)	3.864	4.172	0.455
		Post	4.104 (0.732)	3.852	4.355	
	TW	Pre	3.338 (0.381)	3.207	3.469	0.687
		Post	3.268 (0.480)	3.103	3.432	
	TW <sub>12</sub>	Pre	8.371 (1.031)	8.017	8.726	0.700
		Post	8.429 (1.312)	7.978	8.879	

\*Including midwife and x-ray technician.

†Significant or “almost” significant (P-value ≤ 0.05 deemed as statistically significant).

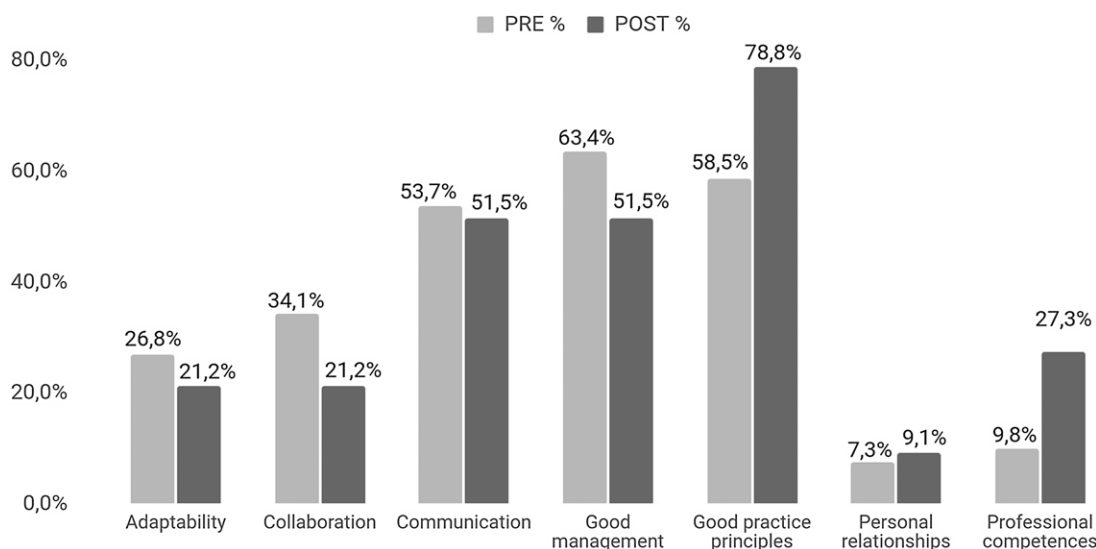


Figure 1. Bar chart showing the detailed distribution of all the themes reported in the open text feedback. The percentages are calculated as number of occurrences/number of available (not missing) answers.

stratified analyses (per role and per age) with a P-value less than 0.05 for SE and TW<sub>12</sub> of nurses and for TW<sub>12</sub> for elder team members (over 45), suggested that missions can improve both ideas and expectations of people regarding teamwork. This seems to be true for experienced people too (SE P-value = 0.062; TW P-value = 0.056). Doubtless, the issue should be further investigated on a larger pool of people and data coming from other field experiences.

At a first glance, these positive findings seem to suggest that the mission alone can be enough to effectively perform as a team; however, at the same time, they clearly highlight the importance of specific training programs focused on teamwork. Indeed, the values of the indexes calculated on the data collected before the mission (lower than the values of the indexes calculated on the data collected after the mission) could be improved: attending to specific training programs have positive effects on people perception of self-efficacy and teamwork skills in the field, as showed by Bodas et al.<sup>13</sup>

This kind of training program could be very important to give people the opportunity to improve their confidence and feel more efficient before a real mission, contributing to the preparedness of the EMTs for future deployments.

The open text feedback provided by team members remarks the importance of teamwork and nontechnical skills for the success of the mission. Specifically, the “communication” (including dialogue, daily briefing, and sharing information), the “good management” (interpreted as definition of roles, leadership, and organization), and the “good practice principles” (such as empathy, patience, coordination, and respect) (see Table 3 for the coding of the themes), have been identified as key aspects for positive outcomes in the field. This is widely confirmed by the literature: in their interviews-based studies, Peller et al.,<sup>11</sup> found inter-professional collaboration and communication as important nontechnical core competencies, while Selvaraj and Sandaran<sup>16</sup> stated that an effective coordination and communication are fundamental to teamwork to

enhance the emergency management quality. In addition, Barelli *et al.* identified communication, coordination, and leadership as significant dimensions of teamwork in their publication “Soft skill in disaster preparedness and relief.”<sup>17</sup> The variable trends observed comparing the “post” data to the “pre” data seem to suggest that the field experience can modify the perceptions of response teams, underlining that people do not have a clear idea of the operational meaning of teamwork and nontechnical skills. Considering the variation of at least 10% of occurrences in the open text feedback, the study showed that people, imagining the following mission, highlighted the importance of “collaboration” and “good management,” while, after the mission, they gave more relevance to other 2 aspects: “good practice principles” and “professionals competences”. These results confirmed, once again, the need of specific training programs to increase people awareness regarding teamwork and nontechnical skills.

### Limitations

Finally, some limitations of this study need to be considered.

First, the small sample size due to the number of people deployed in Mozambique in 2019 and the evaluation criteria limited to the self-perspective of the team members; further larger studies are needed to collect more data and to explore the availability of performance indicators for teamwork and nontechnical skills in the field.

In addition, even if there are some statistically significant results (for SE, TW, and TW<sub>12</sub> for some categories), the overlapping of the confidence intervals of their means lowered the practical significance of such differences. A bigger sample size could slightly address this overlapping effect.

Moreover, pre-test/post-test design is a form of quasi-experimental research that allows for assessment of an intervention applied to a group of study participants; the absence of a control group did not allow to address some limitations inherent in quasi-experimental testing validity<sup>18</sup>: because the mission itself was the intervention whose effect was to be evaluated, it is evident that it was impossible to use randomization in this study. Thus, in case of future deployments, including people not leaving for the mission could support this type of study design.

Lastly, the cultural factor has not been studied: it could be really interesting to investigate if teams from different cultures or working in cultural environments far from that they are used to, would modify the outcomes of the study.

### Conclusions

Teamwork and nontechnical skills in general are essential issues to perform effectively in the field during disasters. According to our findings, humanitarian workers, obliged to work together for the first time without a prior specific training, feel good but not at their best: training programs focused on team dynamics can be really useful to improve self-confidence of people leaving for a mission.

**Supplementary materials.** The supplementary material for this article can be found at <https://doi.org/10.1017/dmp.2023.119>.

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**Author contribution.** Daniela Sacchetto: investigation, methodology, validation, statistical analysis, writing (original draft preparation). Mario Raviolo, Ives Hubloue, Martina Valente: writing (review and editing). Luca Ragazzoni: methodology, writing (original draft preparation), supervision.

**Competing interests.** None.

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