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Applying temporal framework of team processes to emergency medical services (EMS): perceptions of EMS providers

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Thesis

APPLYING A TEMPORAL FRAMEWORK OF TEAM PROCESSES

TO EMERGENCY MEDICAL SERVICES (EMS):

PERCEPTIONS OF EMS PROVIDERS

by

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DEDICATION

I wish to dedicate this work to my most treasured teammate, my wife, Stacie, for her

unshakable support throughout this academic journey. She is my center of gravity. Without

her unwavering support, I could not have completed this thesis. On the other hand, with

her by my side, there is no challenge that can hold me back.

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TEAM PROCESSES TO EMERGENCY MEDICAL SERVICES (EMS):

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WILLIAM G. FERNANDEZ

ABSTRACT

Effective teamwork has been shown to optimize patient safety. However, teamwork

research in Emergency Medical Services (EMS) is sparse. Before successful interventions

can be implemented, the appropriate content of such interventions should be determined.

We tested the applicability of a teamwork processes framework in emergency care

(Fernandez et al., 2008) to the EMS context. We recruited participants from an EMS agency

in Houston, TX, using purposive sampling. Full-time employees with a valid

EMT/paramedic license were eligible. Using semi-structured format, we queried

respondents on task/team functions and enablers/obstacles of teamwork in EMS. Phone

interviews were recorded and transcribed. Structural coding was based on our theoretical

model. Through a deliberative process, we combined codes into candidate themes. Analytic

memos during coding and analysis identified potential themes, which were reviewed/refined,

and compared against our framework. We reached saturation once 32 respondents

completed interviews. Among participants, 30 (94%) were male; the median experience was

15 years.   Our analysis identified the team processes in the Marks' Teamwork Process

Model in four domains: Action, Planning, Reflection and Interpersonal Processes.

Additionally, the concepts cited as being central to team effectiveness in EMS were:

leadership, crew familiarity, team cohesion, interpersonal trust, shared mental models, and

procedural knowledge. The revised model was useful for describing teamwork processes

that providers employ to drive performance in EMS. Additionally, we identified emergent

concepts that influence teamwork processes in EMS. Our findings inform our

understanding of teamwork processes in EMS, and may be useful in guiding future team-

based interventions tailored to EMS.

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INTRODUCTION

Despite improvements in quality and effectiveness in emergency medical services (EMS) (Lammers et al., 2012; Myers et al., 2008), improving patient safety remains an important, ongoing concern (Callaham 1997).   As an integral component of the healthcare system, much work has been done in EMS to improve patient safety by adopting evidence-based approaches to care (Callaham, 1997).   For example, teamwork approaches have been advocated to improve patient safety in EMS (Lazzara et al., 2015; Bleetman et al., 2012; Williams et al., 1999).   In other healthcare sectors, effective teamwork strategies have demonstrated reduction in medical errors in the emergency department (Risser et al., 1999; Morey et al., 2002), reduction in serious complications and lower mortality among critically ill ICU patients (Haerkens et al., 2015), as well as improved operating room efficiency and reducing adverse events in the OR (Weld et al., 2016).

Before successful interventions can be implemented, careful attention is needed to determine the appropriate content of such interventions. Much of the current team research has focused on strategies to boost effective communication (Salas et al., 2008; Pronovost et al., 2009; Pruitt & Liebelt, 2010; Contratti et al., 2012; Muething et al., 2012; Shepard et al., 2013).   However, it isn't clear what types of communication need to be strengthened, or if communication is even the most important component of EMS, as prehospital team research is rather sparse at present (Crowe et al., 2017). More research on teamwork processes in EMS is warranted (Callaham, 1997; Myers et al., 2008; EL Sayed, 2012; Lang et al., 2012).   Should teamwork training in EMS simply focus on best practices for improving effective communication? Alternatively, are there other drivers of team effectiveness in

EMS that should be included in a teamwork training program?   In preparation for creating a teamwork training program tailored to the EMS context, the intent of this study was to identify the key teamwork processes and emergent concepts associated with team effectiveness from frontline EMS personnel. To do this, we tested the applicability of a teamwork processes framework for emergency care to the EMS context.   This will be an important first step in understanding the crucial elements of an effective EMS teamwork training program, as well as to identify the major processes that are important drivers of safe, effective, high-quality care among EMS teams.

This paper is organized as follows: First, we will outline a conceptual framework of a Temporal Model of Teamwork Processes in Emergency Care. Specifically, we will be using the Fernandez et al. (2008) update (no relation to the first author of this paper) of the Marks et al. (2001) teamwork processes model as a blueprint for our study, and outline some of the previous work of relevance in this area.   Second, we will describe our study methodology. Third, we will present the results of our study. In our fourth section, we will discuss our key study results, and compare our findings to the published works of others in this domain. Then, we will comment on our study's limitations. Finally, we will conclude our paper with a brief study summary.

Conceptual Framework

The research on teams is clear: "Patient care is a team sport" (Salas et al., 2008); much of an organization's work is accomplished through teams (Marks et al., 2001).   A team is defined

as an identifiable group of two or more individuals working interdependently towards a

shared goal that requires the coordination of effort and resources to achieve mutually desired

outcomes (Salas et al., 1992). Taskwork is defined as a team's interaction with tasks, tools

and machines, and systems, to convert inputs to outputs. Teamwork refers to the

interaction of two or more individuals to perform a given task (Bowers et al., 1997).   In

other words, taskwork refers to what teams do; teamwork refers to how teams work together

to get things done.

Organizational success is not simply the result of recruiting the most talented individuals,

nor is it due to making the latest technology and resources available to accomplish tasks.   It

is the teamwork processes—the interdependent activities—that allow personnel to

effectively concentrate their efforts to achieve a result beyond the capabilities of individuals

working alone (Marks et al., 2001).   As a road map to understanding how an array of teams

operate within a team performance framework, Marks, Mathieu, and Zaccaro have proposed

a temporally-based model of teamwork processes (Marks et al., 2001).   In this model, they

posit that teamwork processes occur in interacting performance episodes. These include:

Transition processes, Action processes, and Interpersonal processes.   Further refinements

to the Marks teamwork processes model were proposed by Fernandez et al. (2008; again, no

relation to the first author of this paper) that clarify certain processes that occur among

emergency care providers (Figure 1). The changes involve separating the Transition

processes into Planning processes (e.g., setting goals and prioritizing tasks to be completed)

and Reflection processes (e.g., feedback on areas of improvement) as these domains were

thought to occur in distinct episodes of time (Fernandez et al., 2008). Planning processes occur when teams focus primarily on evaluation and/or planning activities to guide their accomplishment of a team goal or objective (Marks et al., 2001). Planning processes are thought to influence team outcomes by focusing teammates' attention on overall patient care goals, determining alternative strategies to accomplish these goals, and by identifying the resources necessary for mission accomplishment (Benzer et al., 2016), and include Mission Analysis, Goal Specification, and Strategy Formulation and Planning. Mission Analysis refers to interpretation and evaluation of the crew's overall mission, including the key tasks to be performed, the operating environment that will be encountered, as well as the human and material resources necessary to accomplish the pending mission (e.g., an ambulance run). The identification and prioritization of major as well as subordinate goals that are aligned with, and necessary to accomplish the overall mission represents Goal Specification. Strategy Formulation and Planning refers to the development of contingency courses of action necessary for mission accomplishment, based on current operating environment and available resources. Reflection Processes occur when team members retrospectively assess their performance, in a manner akin to "sensemaking", whereby individuals give meaning to their experience (Weick, 1995). This includes Debriefing, which refers to a critical evaluation of the events that transpired during the team's performance (Fernandez et al, 2008). In Figure 1, the domains of planning, action, and reflection processes are shaded in blue, while the interpersonal processes domain is in white. Conceptually, this is because planning, action, and reflection processes inform one another over time, while interpersonal processes contemporaneously affect the success of the other processes (Benzer et al., 2016).

Action Processes are those activities that contribute directly to goal accomplishment (Marks et al., 2001). Action processes directly focus group energy and attention towards specific shared taskwork (Benzer et al., 2016), which include: Monitoring progress refers to tracking tasks and advancement towards mission completion. Systems monitoring refers to tracking team resources and external conditions. Team monitoring and backup implies awareness and anticipation of tasks to be completed, as well as "stepping up" to assist a team member who is having difficulty completing a task. Coordination refers to orchestrating the sequence and timing of interdependent actions.

The activities that occur within Interpersonal Processes are those that occur throughout planning, action, and reflection, and help to manage interpersonal relationships. Interpersonal Processes indirectly affect teamwork by influencing interpersonal relationships (Marks et al., 2001). These activities occur throughout planning, action, and reflection processes. As such, they are critical for the effectiveness of other processes (Marks et al., 2001). The following three processes occur across the entire spectrum, and are conceptualized to be interpersonal processes: Conflict management refers to processes that assist with working through task and interpersonal disagreements among team members. Motivation and confidence building refers to processes that increase confidence and motivation among team members. Affect Management is defined as regulating team members' emotions to accomplish team goals.

Methodology

Study Design

We designed this project as a qualitative study of EMS personnel (i.e., key informants) regarding teamwork in EMS. We approached individuals from a fire department-based EMS agency for participation. Prior to enrollment, we emphasized to EMS personnel that they would not be penalized according to their participation status. In the study, we enrolled participants via purposive sampling of eligible EMS personnel that volunteered to complete a 30- to 60-minute semi-structured audiotape-recorded phone interview.

Characteristics of Study Population

The primary sampling frame for this study was a fire-based EMS agency in Houston, TX. This agency has provided emergency medical responders to the city of Houston since 1972, responding to over 225,000 911 calls annually. All firefighters in the agency have been certified at the EMT level of training, while approximately 10% are paramedic-certified. There are approximately 4000 members (3,500 EMTs, 400 paramedics, and 100 supervisory staff) in this system. It is the third-largest EMS agency in the United States.

Enrollment Criteria:

In this study, the key enrollment criteria were:

1) A valid state EMT or Paramedic license, and

2) Full-time employment in the Houston, TX EMS agency

If they had an active license and were full-time employees, EMS managers & supervisory staff also were eligible for participation.

Study Procedures

Confidential, one-on-one telephone interviews were conducted among participants to identify barriers and enablers of effective teamwork in their organization. Interviews were scheduled in advance, and conducted by calling into a conference call service (FreeConferenceCall.com) that allowed for interviews to be recorded on a secured, password-protected site. Prior to commencing the study, we pilot-tested interview questions with members of a separate hospital-based EMS agency in Lawrence, MA.

Recruitment of Study Participants

Study participants were recruited through several ways: 1) recruitment email from the agency's Medical Director, 2) visits to fire stations to promote the study, and 3) announcing the study at a training conference. We explained the purpose of the study to prospective participants, as well as identified the enrollment criteria. Those interested were contacted to set up a phone interview.

We recruited sufficient key informants until we achieved the point of theoretical saturation.

"Theoretical saturation" occurs when additional data collection does not produce additional knowledge or understanding with respect to the study questions (Fusch and Ness, 2015). In other words, this is the point at which an interviewer is able to predict the answers that participants would provide given a certain question (i.e., when no new perspectives on a topic are gained). In order to estimate the sample size necessary for theoretical saturation, the authors anticipated a baseline of at least 15 to 20 interviews (Guest et al., 2012). Given the nature of the study, and the degree of segmentation within the organization by professional certification (i.e., paramedic vs EMT) as well as by rank (officers, such as Fire Captain, vs. firefighter-EMTs or firefighter-paramedic), we anticipated that we would have to sample double our initial estimate (i.e., a range of approximately 30 to 40 key informants) to reach theoretical saturation. We estimated a 50% dropout rate among enrollees. To account for this, we planned to recruit between 60 to 80 EMS personnel in order to satisfy our ultimate participation goal of 30 to 40 participants that would complete their telephone interview.

Key-Informant Interviews

Phone interviews followed a semi-structured format. Key informants were asked grand tour questions regarding typical EMS runs during a typical shift (e.g., "Can you walk me through a typical ambulance run during a typical shift?"). These initial questions were followed up with questions about specific teamwork processes (i.e., Planning processes: "What are you thinking/saying to your partner on the way to the scene?"; action processes: "During a typical 911 call, how are tasks divided up between partners?"; "When you're on the way to

the hospital with a patient, what sort of things are you thinking/doing?"; "Can you describe

a typical interaction between the EMS crew and the hospital staff?"); reflection processes:

"What sort of things happen after you've handed off care at the hospital and you're on your

way back to the station?"; and interpersonal processes: (e.g., how often are there

disagreements about what should be done?"), routine taskwork activities (e.g., What sort of

tasks are typically required during a typical call?"), as well as taskwork activities that required

teamwork (e.g., "What tasks are better done by groups of 2 or more, rather than by just one

person?"). Additionally, Officers in the fire department were asked about

supervisory/coordination activities (e.g., "What makes your job managing a critical event

such as a multi-casualty incident go more smoothly?"), or the role of senior

leadership/management in promoting teamwork (e.g., What can senior

leadership/management do to promote teamwork?"; "How does scheduling crews for 24

hours at a time affect teamwork?"). Finally, participants were asked about enablers and

barriers to teamwork in their typical work day. The complete interview protocol is available

in Appendix A. The lead author (WGF) conducted all interviews. No personal identifiers

were included during the interviews.   All interviews were audio-recorded, transcribed

verbatim, and reviewed for accuracy. The Boston University School of Medicine

Institutional Review Board approved this study.

Coding Process

We used a commercially-available software program designed for qualitative data

management to code data for later analysis (NVivo 11 Student Version; QSR International,

Victoria, Australia). We created a codebook, where data were systematically sorted into 73

categories (Guest et al., 2012). WGF categorized coherent thoughts identified within the

textual data using deductive 'theory-based' codes.   A key part of this process was the use of

"memoing" in which observations were made during the data analysis, including annotation

of interesting, unique, and recurrent patterns in the text, and preliminary coding decisions

were recorded. Additionally, WGF identified inductive codes by reviewing data that was not

captured within the theory-based coding. This resulted in 6 emergent concepts, such as

leadership, shared mental models, crew familiarity, and team cohesion.

Data Analysis

 We used a thematic analytic approach (Braun & Clarke, 2006; Guest et al., 2012), to identify

themes within the coded data. WGF conducted all data analyses by reviewing transcripts

(Braun & Clarke, 2006) in an iterative process to engage closely with the data. Two authors

(WGF, JB) combined codes into candidate themes that depicted the data accurately. Unlike

codes, themes consist of ideas and descriptions that identify what the data is about and/or

what it actually means (Saldana, 2009). In other words, themes are distinct units of meaning

that are observed in the textual data. Several candidate themes emerged from this process.

Finally, all authors reviewed the candidate themes to determine how they supported the data,

and how they aligned with the Marks teamwork processes framework, as modified by

Fernandez et al. (Morse and Mitcham, 2002).   All authors iteratively selected themes that

were most relevant, and made the most meaningful contribution to understanding what was

going on within the data. The result of this deliberative process was the revised model of

teamwork processes applied to EMS. A summary of themes along with illustrative quotes is presented in Appendix B.

RESULTS

We reached a point of saturation once 32 respondents completed phone interviews. (Table 1). Participants were selected from across the organization, from firefighter-EMTs with 1 year of experience in EMS to senior fire captains with 40 years of experience; the median work experience was 15 years. The sample consisted of substantially more males than females (30 vs 2), which is consistent with the percentage in the organization as a whole. The sample consisted of substantially more paramedic-certified firefighters (28 vs 4) than those certified as EMT, which is in contrast to the actual proportion of EMTs to paramedics within the agency (approximately 3500 to 400, respectively). However, the general responses to query items were quite consistent for both EMTs and paramedics. The interviews with participants demonstrated general support for the teamwork processes in emergency care framework by Fernandez et al. Table 2 highlights the percentage of participants that mentioned a specific teamwork process and/or emergent concept. The processes that received the highest mentions were coordination, affect management, and strategy formulation. Additionally, six emergent concepts were identified during the open coding phase of data analysis: leadership, crew familiarity, team cohesion, interpersonal trust, shared mental models, and procedural knowledge.

Action Processes

Monitoring Progress

Monitoring progress refers to tracking task progress, interpreting current needs, and communicating such progress to team members (Marks et al., 2001). On an ambulance run, this may refer to maintaining situational awareness of a patient's changing condition.

> "As the in-charge [provider on scene], I think, on the ambulance, I would be still dealing directly with the patient to figure out what's going on, what's hurting, and whether I'm taking care of that, or depending on what's wrong with him... and making sure that everything is managed there." (Respondent (R)-7, Firefighter-EMT).

In the case of a mass casualty incident, monitoring progress may refer to providing the fire captain (incident commander) real-time feedback on the patients that a given team is managing, in order to help improve collective situational awareness.

> "So then we get on scene, we try to identify who's in command, and then see what role he gives us when we get on scene, which more than likely if there's already units there we're going to be kind of triage or transport, and then we just assume those roles.... and then, like I said, we sort out the most critical patients and if we needed transport, we transport or triage on scene or do we just sort 'em out for other units to come by and pick them up." (R-17, Engineer Operator-Paramedic)

Systems Monitoring

Systems Monitoring refers to tracking the team's personnel and material resources, as well as the environmental conditions that may impact the overall mission (Marks et al., 2001). In patient care, this may refer to identifying the necessary personnel to carry an obese patient from a high-rise apartment to the ambulance, or identifying the structural hazards that may impact the safe transport of the patient.

> "So once we pull up onto the scene, then, we…. make a scene assessment, we're looking for any hazards… such as traffic…. is there heavy traffic in the area? Do we have to block additional lanes of traffic for our safety as well? Are there any power poles involved, and kinds of electricity that may be involved… may be touching the vehicle? We also look for fires, or any kinds of fluid leaking that's coming from the vehicle. We try to identify if there's another vehicle, or any other patients that may be out walking around. And this is all prior to exiting the ambulance" (R-2, Engineer Operator-EMT).

The identification of environmental hazards also implies attending to personnel and patient safety risks.

> "Number one is scene safety. It should be scene safety, and you find out your conditions what you're going to be doing and then what resources are going to be needed. And then you work off of that…. we kind of work off of the CAN: conditions, actions, needs, and then you request additional resources if needed, or you…. just to set the scene, the situation, the patients, and determine their acuity,

and determine extrication, or determine which hospital will be transported to do to the level of care needed." (R-3, EMS Supervisor)

Team Monitoring and Backup

Team Monitoring and Backup refers to activities related to supporting team members perform tasks by coaching, providing assistance with a task, or by completing a task for a teammate (Marks et al., 2001).

> "How are the [tasks on a 911 call] divided? If it's just he and I responding without any help from pumpers [fire engines] or another ambulance or stuff, he knows he can get on scene and start talking to the patient while I will immediately go and take a set of vitals and I'll start working on an EKG and then that way he doesn't have to worry about doing all that by himself, and he can worry about talking to the patient, figuring out what's going on, and at the same time, I'm listening for what he saying and I'm listening to what the patient saying, so that we'll both know what's going on." (R-17, Engineer Operator-Paramedic)

Coordination

Coordination activities refers to orchestrating the sequence and timing of interdependent actions (Marks et al., 2001). In emergency care, this refers to synchronizing various tasks with one another. These tasks are typically role-based, depending on one's position in the

ambulance (e.g., the Firefighter-EMT typically assumes the direct patient care role, while the Engineer Operator [EO] plays a supporting role).

> "Everybody's got a specific role to begin with.... usually the in-charge on the ambulance is going to be the one who is, kind of determining what needs to happen.... I guess the roles could change, because, for example, if the pumper got there first, they're the ones that are doing the C-collar, and talking to the patient, and then, if I come in on an ambulance after we pull out in front.... I'm not going to take over for what he's doing. I'm just going to go back to another role.... I wouldn't say nobody's going to get bent out of shape if someone's doing their job. They just.... there's always something else to do." (R-07, Firefighter-EMT)

Interpersonal Processes

Conflict Management

Conflict management refers to establishing conditions to prevent, control, or guide team conflict (preemptive) or working through task and interpersonal disagreements among team members (reactive) (Marks et al., 2001).

> "I will not call out my partner in front of the patient or the surrounding citizens, or the... additional fire apparatus, or EMS apparatus that are there. I may pull them off to the side, or whisper in their ear, 'hey lets go down this road', or 'what do you think about this particular issue here', if they catch something that I haven't caught

or make a decision in a different direction than what I was thinking, I'll ask them, 'Where are we going with this?' and if they don't give me some good substantial reasons based on training and experience, then I may say, 'hey, is that the right direction to go?'. I never make a huge issue on the scene" (R-2, Engineer Operator-EMT).

"If there is a disagreement, for instance, to give you an example, if there is a case that I feel needs to be transported and my partner feels otherwise, how usually tell him I think I'll start off at the lowest level and say 'Hey listen I think we need to transport this one', and if you resist or is stubborn about it and say 'No, I'm not going to do it', in that case [I'll say] 'why don't you drive, and I will do patient care, and we'll talk about it afterwards'. After the fact, we talked about it and we both express at our sides or our opinions about it and hopefully come to a cordial resolution which most of the time happens. Very seldom will somebody be upset about it and just continue screaming" (R-17, Engineer Operator-Paramedic).

Motivation and Confidence Building

Motivation and Confidence Building refers to team members encouraging and motivating one another, maintaining the collective morale among team members (Marks et al., 2001).

"If there's something I could add, something I learned in the military... a gunny sergeant told me that if you have rank and you're in a position of leadership, it's very easy to tell someone to do something for you, it's a lot harder to motivate them to

make them want to do it for you. I try to motivate people a lot of times too, either by doing [the task] with them or communicating exactly what I need done in order to alleviate confusion and stuff.... and most of the time, it works out to where people wanted to, are motivated to do what needs to be done." (R-17, Engineer Operator-Paramedic)

Affect Management

Affect management refers to activities to regulating emotions and managing stress among team members during mission accomplishment (Marks et al., 2001).

"[What happens after you've dropped a patient off at the hospital?]   A lot of times we just BS… you know, we're just talking. It's very rare that we carry that incident with us once we leave them at the hospital. I know for myself it doesn't take long for me to forget whatever I've seen or done. It's just you kind of learn to turn it off, I suppose. You learn to turn your emotions off so that once I'm done with that you know I've done my job and I learned a long time ago that separate my emotion from it, well from most of the calls, anyhow. I know for me, the only [cases] that really usually stay with me, and maybe we'll talk about a little bit, are usually the ones that have to do with kids, or maybe elderly people. But it's usually just kids. And sometimes we'll talk about it a little bit. Fireman don't... or guys that have some time, they don't carry it with them. You learn to disconnect and to do your job and disconnect emotionally, and then once you're done with it like you said you're ready

to turn the page." (R-5, Firefighter-EMT)

"[What can be done to maintain good teamwork and communication?] Not allow the [external] barriers, or the outer communications [external to your crew] to affect your day-to-day operations. And not to let the politics and the bureaucracy get to you. And come to work and do a hundred percent and that would help a lot." (R-3, EMS Supervisor)

These quotes, representative of the comments on this topic, demonstrates that while affect management is an important part of the job, the most common strategy for regulating emotions and managing stress is one of self-correction. None of the other interviewees offered comments on specific, active strategies that EMS crews employ to regulate emotions and manage stress among their fellow teammates.

Planning Processes

Mission Analysis

Mission analysis is defined as the interpretation and evaluation of the team's mission, consideration of the team's environment, and needed resources (Marks et al., 2001). In EMS, teams within ambulances will be alerted to an emergency situation from the central dispatcher. Either prior to pulling out of the station, or while in route to a call, team members will assess the overall situation based on the information relayed by dispatch, and establish the major goals of care.

"Well if it's an EMS call, there's just two of us in the squad which I'm on now, and

we look at the call note on the screen we'll look at the address, go over the call and if

we see anything special like breathing problem or if it's a cardiac arrest…. we talk

about things real quick." (R-10, Firefighter-Paramedic).

However, in the case of large-scale events, mission analysis may be more of an ongoing

process based on the fluidity of the situation.   For example, EMS supervisors are dispatched

in the event of larger scale events, such as warehouse fires or multi-casualty traffic collisions.

In such cases, mission analysis is tightly linked to coordinated action.

"Since I'm an EMS supervisor it's my responsibility, if I'm dispatched, to gather as

much information and try and play a traffic controller and gather all the information

and then utilize it and come up with the action plan." (R-3, EMS Supervisor)

Goal Specification

Goal Specification refers to identifying and prioritizing each of the subordinate goals that are

necessary to accomplish the overall mission (Marks et al., 2001). In EMS these may include

identifying the number and extent of ill or injured patients on scene, determining which

patients need immediate or specific medical attention (e.g., airway management or overdose

reversal therapy), or identifying the appropriate facilities to transport patients (e.g., nearest

burn center or pediatric trauma center).

"I'm usually in charge [paramedic provider on scene].... number one thing it's just to make sure that our scene is safe, like I said, if we need any additional personnel... normally will also require P.D. [police department] just for traffic control or any other situation that we would need them for." (R-8, Firefighter-Paramedic).

Strategy Formulation

Strategy formulation activities consist of developing alternative courses of action for mission accomplishment (Marks et al., 2001). In EMS practice, this refers to contingency planning in order to generate a "Plan B" if case a given course of action is not able to be carried out.

"Most of the time, my Engineer-Operator (EO) and I, we go over, like, with the scenario that we've been given, we'll talk about it on the way there, and do 'what if's' and stuff like that" (R-1, Firefighter-EMT).

"Once we get all of those note... my partner and I... we know what our roles are, and we're going to kind of formulate what each one of us is going to undertake as soon as we get on scene such as, are we gonna triage real quick, or assist other units that are on scene and triaging, and try to figure out, depending on how soon we arrived whether we are the first EMS unit to arrive, or the second or third, you know, we gotta try to sort out the most critical patients and take care of those for transport. So we do that on the way we talk about it we talk about the worst case scenario, and anything less than that is even better." (R-17, Engineer Operator-Paramedic)

Reflection Processes

Debriefing

Debriefing refers to the post-event critical analysis of a team's performance (Fernandez et al., 2008). In practice, these activities typically are meant to provide feedback on one's clinical assessment, as well as to help improve future performance.

> "A lot of times we'll talk about the call armchair quarterback or Monday morning quarterbacking. Could we do anything different? Is there anything that we missed? Sometimes we'll follow up with the hospital after the fact to see or confirm what we thought might be going on to find out if it's true or maybe it was something completely different" (R-15, Firefighter-Paramedic).

> "[At the end of a call] I'm always thinking about what we could have done better. How did things go and what could we have done better? And my partner is usually pretty good about thinking about those sorts of things also, and so once he's done with his part, and I'm done with my part, we meet up at the unit again in the front cab, and we talked about it. We talk about things that might not have gone our way or things that were perfect and we want to repeat that again the next round if we have one like it and we do a self-critique. I ask him, 'Is there anything I could have done better for you', and he does the same thing, and then we talked things back and forth like that. Once we do that, we take a breather, and we head on down to the next one" (R-17, Engineer Operator-Paramedic).

Emergent Concepts influencing Action Processes

In addition to the concepts in our framework, several concepts emerged inductively from our analysis: leadership, crew familiarity, team cohesion, interpersonal trust, shared mental models, and procedural knowledge.

Leadership

Team leadership refers the ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, motivate team members, plan and organize, and establish a positive atmosphere (Alonzo and Dunleavy, 2013). Leadership influences coordination by enabling a structure where senior members assign tasks to their subordinates--complimentary tasks that must be coordinated with one another. In turn, these subordinates assign specific, focused tasks to their subordinates, whose tasks also must be coordinated with one another.

> "The shoot-from-the-hip description on how I handle large incidents or any incidents I'm involved in.... [an example is the] span of control that I can comfortably handle is about seven people answering to me, and I try and divide the incident into manageable chunks where I have perhaps seven officers underneath me they have perhaps seven people responding underneath them and I try to break up the large incident whether it's a high-rise fire or a warehouse fire or multi-casualty incident into manageable sections that people under stress can deal with effectively. Sort of a divide-and-conquer situation if that makes any sense" (R-11, District Chief).

Additionally, leadership influences coordination through on-the-spot adjustment and course-correction of personnel by supervisors. Leadership may be more important to coordination when personnel are not experienced, and lack sufficient procedural knowledge.

"If we have some young, inexperienced paramedics with some... it usually doesn't go too fine, but once the young paramedics get experience, then it runs a little smoother. Usually I'm there to direct the young ones to make sure they're doing what they're supposed to do". (R-22, EMS Supervisor).

"People who are overseeing the event need to not get involved in that, and stay in a position to where they can oversee, and they can catch the guy whose hands are in the wrong spot when he's doing CPR.... or see that this guy is having difficulty placing an airway. If he gets... if you get involved in tasks, you lose sight on other things that are happening around them. So I think part of teamwork is that there's gotta be someone in charge, someone who oversees everything, and then everybody needs to know what their tasks are." (R-29, EMS Supervisor)

Shared Mental Models

Shared Mental Models, defined as team members' overlapping mental representation of key elements of the team's task environment (Klimoski and Mohammed, 1994; Canon-Bowers et al., 1993), influence coordination by promoting members' ability to anticipate and synchronize individual efforts to accomplish collective action.

"I've gotten to a point where I can read my partner, you know, with nonverbal cues, and when it's with someone else, we kind of have to... I don't know, it just seems like there's more hiccups involved.... maybe it's not a smooth, although we should be following the same protocol, it should be kind of the same process for each of our calls. But, once you've developed history, and have experience with the same person over and over, you kind of already know what to expect" (R-08, Firefighter-Paramedic).

"I would want to work with my officer and my crew on something like that because I know how my Captain thinks, I know how my crew operates…. so there's a level of comfort for me, and feeling like things are going to get done right if I'm working with my crew." (R-05, Firefighter-EMT)

However, without periodic maintenance the clear sense of shared understanding may diminish, and may lead to teammates that are out of sync with one another.

"I would say we tend to get too comfortable maybe sometime on scene, and guys have been doing this for so long, sometimes you don't get communication. These guys are just doing their job and everybody kind of knows what to do for the most part, but like I said before there's never such a thing as a perfect run so I think the guys just get kind of get you know probably just like too comfortable and it just becomes like second nature. I don't know, I'm the type that... I'm probably over-communicating, which would be better in my eyes than to not say something when it's critical to everybody involved, so... but you know I've been guilty of also under-communicating and you know I try to BS because especially when I'm in charge of a

scene it's my job to communicate to the entire team…. if I'm not communicating, then it falls on me" (R-08, Firefighter-Paramedic).

Procedural Knowledge

Procedural Knowledge refers to the knowledge exercised in the performance of a specific task (Anderson 1982; Banks and Millward, 2007). It influences Team Monitoring & Backup by improving individual's understanding of each member's roles in a given task. This knowledge allows a given member to "step up" and either provide coaching or assist in the completion of a task for a fellow teammate if needed.

> "For example, my current partner I work with.... the reason why I wanted to work with him is because he has a very good knowledge of the job and the protocols. He's very experienced, and when it comes to critical patients, if we get orders for something that maybe is not in the protocol, something that we need orders for, before I know it, he's on the phone, I'm taking care of the patient, and I'll have orders [from the medical director] before you know it, and we're good to go... very fast and efficient" (R-04, Firefighter-Paramedic).

Emergent Concepts influencing Interpersonal Processes

Leadership

In addition to its other effects, leadership directly influences Motivation & Confidence

Building by "setting the tone", and motivating subordinates.

> "I really think these guys will follow you off the edge of a cliff if you…. if they feel
>
> they can trust you.... If they feel confident in you, if they feel you have their best
>
> interests in mind, they will do whatever for you to bend over backwards." (R-16, Fire
>
> Captain)

Crew Familiarity

Crew Familiarity (or crew consistency) derives from an aspect of team design (i.e., the

employee schedule) in which teams maintain a consistent schedule with one another over

time (Paterson et al., 2011). Crew familiarity may strength a team's ability to use Affect

Management by establishing mutual understanding of one another's personal lives.

Equipped with this knowledge, teammates may better regulate one another's mood.

> "Not knowing your partner makes it very difficult, day to day, and some of the
>
> reasons are the dynamics not only what's going on at home with that person,
>
> whether it may be some marital problems, whether your partner may be moving into
>
> a new home, whether they're having problems with their mom and dad they might
>
> have had some issues with their children, whatever it may be. So someone who is

partnered consistently together, you know day-to-day what's going on, you have a relationship, and you understand the dynamics of what's going on behind the scene, which in turn makes a 24 hour shift a lot easier to navigate and to navigate the easy calls, and even to navigate the bad calls. And the easy calls would be something similar to what you just described. A bad call may be an incident involving a small child that you had you had to perform CPR on, or a mass casualty in one particular vehicle. So, being paired up with the same partner, I think personally would make the shift a lot easier, would make our emotions and dealing with those emotions a lot better, our psychiatric health as well on calls a lot easier as well." (R-02, Firefighter-EMT)

Team Cohesion

Team Cohesion, the affective attraction to a team, its goals, as well as the desire to remain part of the team (Zacarro and Lowe, 1986), positively influences Motivation and Confidence Building through the promotion of self-efficacy that results from the shared experience of work-related and leisure time activities with fellow teammates.

"I will tell you this: stations that eat together, and do things together are the best stations to go to, and it is [reflected in] the work they do on scene." (R-27, Engineer Operator-Paramedic)

Interpersonal Trust

Interpersonal Trust, defined as the shared belief that team members will perform their roles and protect the interests of their teammates (Salas et al., 2005), influences Conflict Management by improving civility between teammates, and reducing interpersonal conflict.

> "A lot of times you don't have the—not necessarily an argument—but you don't have [a debate] in front of the patient, you just know if there's a change or whatever, 'we're going to go this route, then we're going to do this route because I know I can trust you that there's a reason for that', and then after the scene we can discuss.... If anything could be rationalized to me, or if you can prove that it's going to work out better... then I'm open to any kind of change or any kind of thing that's going to be better for the patient" (R-14, Engineer Operator-Paramedic).

DISCUSSION

While the majority of the scientific literature has focused on strategies to boost communication skills as a way to improve team outcomes, our aim was to identify team processes and emergent concepts that were critical to successful teamwork in EMS. In this theory-driven study, we sought to extend the Temporal Model of Team Processes in Emergency Care (Fernandez et al., 2008) framework to the EMS context. To our knowledge, this is the first empirical research applying a teamwork framework to the EMS context. Our thematic analysis identified the major teamwork processes which were grouped in 4 separate domains: Planning, Action, Reflection and Interpersonal Processes

(Fernandez et al., 2008), which corresponded well to the elements of the Fernandez model. Additionally, our analysis uncovered several emergent concepts that were cited as being central to team effectiveness in EMS. These concepts included leadership, crew familiarity, team cohesion, interpersonal trust, shared mental models, and procedural knowledge. In contrast to conventional interpretations of interpersonal processes, we found that individuals self-regulate their emotions rather than addressing them as part of team's interpersonal processes. Finally, the relationships between the emergent concepts and teamwork processes are illustrated in our revised model of teamwork processes in EMS (Figure 2b).

In our study, leadership was revealed as influencing both action and interpersonal processes. In other words, EMS providers felt that effective leadership is critical to ensuring that "things get done" (McGrath, 1962; Fleischman et al., 1991), but also to creating the conditions that facilitate team effectiveness (Hackman, 2002). These behaviors can be broadly separated into two categories: task-focused and person-focused leadership behaviors (Burke et al., 2006). Task-focused behaviors are defined as leadership activities that foster understanding of task requirements, as well as the procedures for task completion (Burke et al., 2006; Fleischman et al., 1991; Salas et al., 1992). On the other hand, person-focused behaviors are those behaviors that facilitate behavioral interactions, cognitive structures, and attitudes so that members can work effectively as a team (Salas et al., 1992; Hackman, 2002; Burke et al., 2006). In a recent meta-analysis, both task-focused (understanding/accomplishing functional tasks) and person-focused (promoting norms) behaviors were noted to be important correlates of team performance, productivity and

learning (Burke et al., 2006). The current study shows how leadership affects EMS teamwork processes.

Additionally, we found that shared mental models were linked to coordinated action. A study of primary care teams revealed a similar relationship between shared mental models and the action process of coordination, which was helpful for managing unexpected situations (Benzer et al., 2016). Along the same lines, Alonzo and Dunleavy (2013) point out that teammates with a shared understanding of the collective tasks to be done are more likely to interpret situational cues similarly, improving coordination. Such a common understanding of a team's tasks, task strategies, likely scenarios, and likely contingencies allow teammates to anticipate each other's needs, and coordinate activities (Mathieu et al., 2000).

The concept of procedural knowledge was found to be important to the action process of team monitoring and backup. Procedural knowledge refers to the tacit information gained from hands-on task-specific training (i.e., "know-how"). This type of learning is different from declarative knowledge (i.e., "know-what"), which arises from factual learning. With respect to procedural knowledge, Marks et al (2002) found a similar association between procedural knowledge and the development of backup behaviors through cross-training. These authors suggest that such type of training activities may lead to greater team effectiveness.

Crew familiarity was found to influence affect management in our study. Crew familiarity is an aspect of team design (i.e., the work schedule) that results in groups of individuals that work alongside one another on the same shift, maintaining a stable work group over an extended period of time. The findings from Patterson et al (Patterson et al., 2011) were in alignment with our results that crew familiarity can influence both interpersonal and action processes. Patterson reports that, among the three EMS agencies studied, EMTs work with their most frequent partner only 35% of the time (Patterson et al., 2011). Patterson notes that unfamiliar EMS teams might be "unclear about their partner's expectations and may be hesitant to speak up when necessary" (Patterson et al., 2011). Gersick noted that such unfamiliar teammates may feel "anxiety, confusion, or apprehension" as a result of such lack of professional familiarity with one another (Gersick 1988, 1989). Furthermore, Patterson and others noted that EMS teams with limited prior exposure to one another are more likely to experience lower quality performance (Patterson et al., 2011; National Transportation Safety Board, 1994; Harrison et al., 2003; Smith-Jentsch et al., 2009).

We found that team cohesion, the desire to bond with and maintain ties among team members, was positively related to motivation and confidence building. As noted above, the shared self-efficacy that members had when working with "my crew" gave EMS personnel a sense of collective confidence in their team's ability to accomplish challenging tasks. Similarly, in a meta-analysis by Beal et al. (2003), these authors found that interpersonal attraction among teammates was associated with an increased motivation for teammates to perform well on tasks.

Additionally, we found that interpersonal trust was an import concept that influenced

conflict management. A similar relationship was observed in primary care teams. Benzer and

colleagues (2016) found that psychological safety influences the interpersonal process of

conflict management. Benzer et al. (2016) noted that "psychological safety promotes

effective interpersonal processes by strengthening a collective sense of trust", which is

closely related to the concept of trust that emerged from our participant interviews.

We also found that EMS personnel compartmentalize their emotions rather than addressing

them as part of open interpersonal processes within the organization. While many EMS and

fire service organizations employ staff psychologists, conduct training on managing

occupational stress, as well as sponsor in-house peer support groups to address occupational

stress, depression and PTSD, the culture of many fire departments is one of "do not admit

weakness or admit to needing help" (Sivak, 2016).   Similar barriers to admitting a mental

health problem are seen in the military setting, where approximately 60% of military

personnel who experience mental health problems do not seek help. (Sharp et al., 2015)   It

is presumed that the negative stereotypes of personnel with psychological problems reduces

service members' motivation to seek help. (Britt, 2007). As in the military context, changing

the culture in the Fire Service to encourage members to seek out and receive mental health

services is necessary (Markley, 2016).

The revised framework (Figure 2b) may be useful in laying the groundwork for interventions

to increase effective teamwork the prehospital context. In particular, team training methods

such as TeamSTEPPS® (King et al., 2008; Woehl, 2014) and the like have been shown to be

effective at improving leadership, situation monitoring, mutual support, as well as

communication, and has led to improved team performance (e.g. Marks et al., 2002; Volpe et

al., 1996). Specifically, TeamSTEPPS® could be adapted for EMS crews to develop

leadership skills by encouraging the team leader (the "In-charge" EMT or paramedic) to

provide briefs, huddles, and debriefs.   For example, assuming such information was

provided by dispatchers, a team leader could provide a planning brief to her ambulance

partner or fire company en-route to the scene of a 911 call. This would increase the team's

shared mental models of the most likely (and most serious) conditions to expect, as well as

the management of these conditions. During a 911 call, the team leader could perform

problem-solving huddles to identify and address challenges that arise during the course of

patient triage, treatment or transportation. Finally, the team leaders should conduct an

informal post-run debrief to identify what went well, and what could have been done better,

as well as areas for future process improvement.

Overall situation monitoring and shared mental models could be enhanced through team

training using simulated exercises that incorporate the use of the STEP pneumonic (i.e.,

Status of the patient, Team members, Environment, Progress toward goal). The status of

the patient can be assessed by obtaining a focused patient history, inquiring about

medications and allergies, taking vital signs, and performing a physical examination. The

status of team members can be determined by assessing members' level of fatigue, workload

balance, and overall stress level, for instance. To assess the environment, personnel should

consider the equipment on scene, as well as the capability of the receiving facility that will be treating the patient. Finally, in order to assess progress towards the goal, teams should frequently reassess the patient's status, review the tasks that have been performed, and determine if the goals of care fit with the patient's current status (Woehl, 2014).

Team training may also be useful to improve mutual support in EMS by modeling expectations for task assistance, respectful feedback and conflict resolution techniques. For example, in the spirit of patient safety, team members should practice asking for and offering to help to prevent work overload. Teams should practice giving specific, respectful feedback that is directed on improving patient care. Finally, conflict resolution techniques should be practiced using the Two-challenge rule, and the DESC or De-escalation Script (Woehl, 2014).

Communication among new or unfamiliar members of a given crew could be improved by drilling on such techniques as call outs, check backs, and handoff communication skills. A well-described technique used in TeamSTEPPS® training is SBAR: Situation, Background, Assessment, and Recommendation. Additionally another technique that has been successfully implemented is the I-PASS mnemonic: Intro, Patient information, Assessment, Situation, Safety issues (Woehl, 2014). Such techniques to standardize face-to-face communications during the transition of care between EMS providers and ED personnel is "critical to improving patient safety, reducing medicolegal risk, and integrating EMS with the health-care system" (American College of Emergency Physicians et al., 2014).

On the other hand, there are certain processes and emergent concepts that formal teamwork training may not improve on its own. As noted above, procedural knowledge is a skillset that is acquired through hands-on experience. Crew familiarity is a result of organizational design, where employees are scheduled to work together consistently over time. Two potential byproducts of this are that 1) team members often grow an affinity or closeness for one another, which helps to develop strong bonds linking one another, and 2) such familiarity and cohesion will nurture a sense of interpersonal trust. Future work could elucidate whether familiar teams (i.e., those that are scheduled to work together consistently) are more effective as a team (e.g., more efficient at task completion, reduction in adverse events, greater job satisfaction) than EMS crews that are extemporaneously assembled (i.e., pick-up teams).

Our study was not without its limitations. First, we conducted the study among members of a large, fire-based EMS agency. In addition to the risks of sampling from a single agency, the choice of a fire-based EMS agency may limit the generalizability of our findings to agencies whose emergency care services are not organized within a fire department structure. However, the majority of all EMS agencies in the United States are configured as fire department-based (Federal Interagency Committee on Emergency Medical Services, 2012). Second, as a result of our sampling approach, we enrolled substantially more paramedics than EMTs (an 8 to 1 ratio). This is in contrast to our sample population, where the proportion of EMTs to paramedics in this agency is 9 to 1. However, we detected no differences between EMTs and paramedics with respect to interview responses or theme

elicited. Nevertheless, our aim was to sample a range of EMS providers, including those in senior leadership positions. This likely also led to further oversampling of paramedic-certified personnel.

CONCLUSION

In this thematic analysis, we applied a teamwork framework to assess EMS providers' description of the processes they employ to convert individual skills, knowledge and resources into team performance. Our findings both inform an evolving team process framework applied to EMS, and are in keeping with those of other studies. Our findings will inform an evolving conceptual framework of teamwork in emergency care applied to the unique context of EMS teams, and may serve as a blueprint for future work to establish team-based training interventions specifically tailored to the EMS environment.

TABLES AND FIGURES

Figure 1. Temporal Model of Teamwork Processes in Emergency Care (Fernandez, et al.
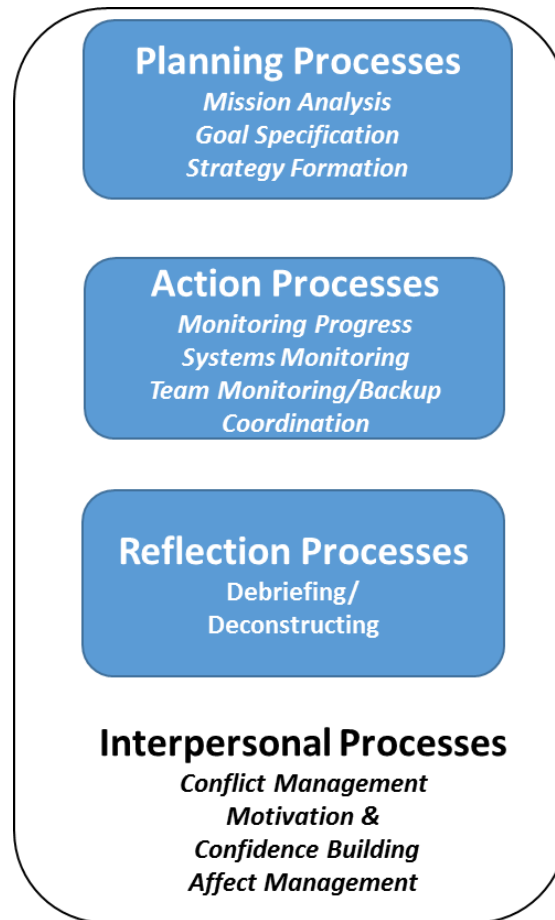
2008)

Table 1. Demographic Characteristics of Sample (n=32)

Gender
  Female 2
  Males   30

Professional Certification
  EMT   4
  Paramedic 28

Rank
  Firefighter: 9
  Engineer Operator (EO): 7
  Captain: 12
  Senior Captain: 3
  District Chief: 1

Experience:
  Median: 15 years
  Range: 1–40 years

Table 2. Frequency of Team Process and Emergent Concept Mentions (n=32)	
Planning Processes	
Mission Analysis	15 (47%)
Goal Specification	3 (9%)
Strategy Formulation	25 (78%)
Action Processes	
Monitoring Progress	17 (53%)
Systems Monitoring	14 (44%)
Team Monitoring & Backup	20 (63%)
Coordination	30 (94%)
Reflection Processes	
Debriefing	20 (63%)
Interpersonal Processes	
Affect Management	29 (91%)
Conflict Management	21 (66%)
Motivation and Confidence Building	22 (69%)
Emergent Concepts	
Leadership	17 (53%)
Crew Familiarity	20 (63%)
Cohesion	6 (19%)
Interpersonal Trust	11 (34%)
Shared Mental Models	26 (81%)
Procedural Knowledge	22 (69%)

Figure 2A. Initial Model of Teamwork Processes in Emergency Care (Fernandez, et al. 2008)
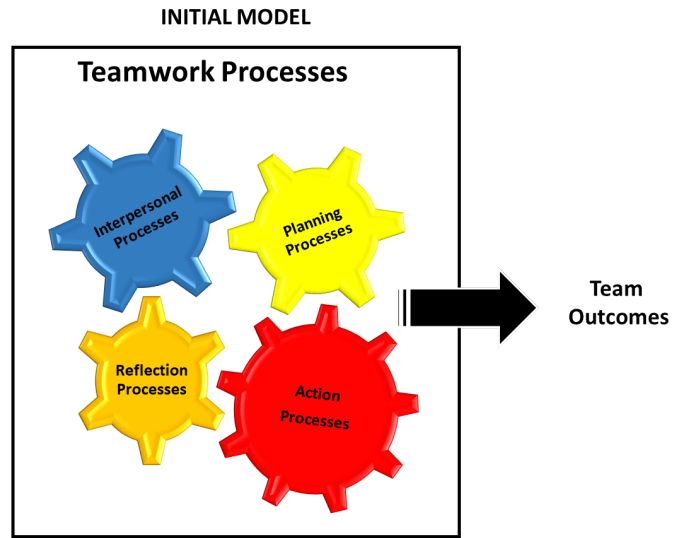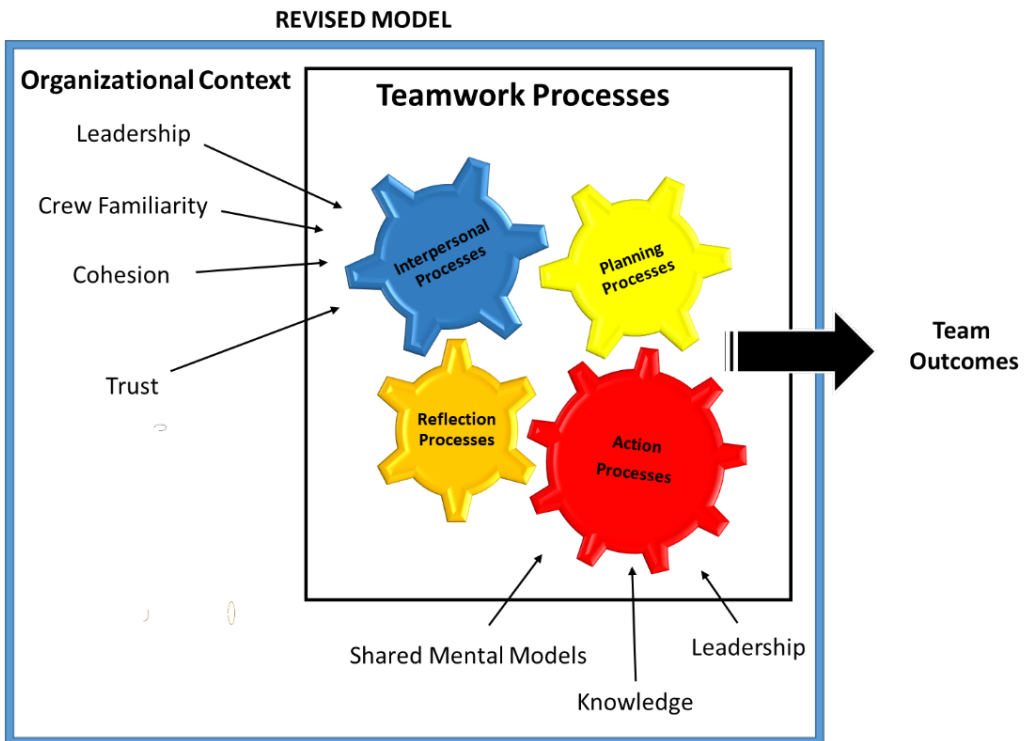

Figure 2B. Revised Model of Teamwork Processes in Emergency Care, applied to EMS

Appendix A. Interview Protocol for Firefighters

I'd like to thank you for participating in the study.

First off, just a few demographic questions:

1)   PROFESSIONAL CERTIFICATION (EMT/PARAMEDIC)

2)   RANK (FIREFIGHTER, EO, CAPTAIN, SENIOR CAPTAIN, ETC)

3)   YEARS OF EXPERIENCE?

4)   MALE/FEMALE

CAN YOU WALK ME THROUGH A TYPICAL AMBULANCE RUN DURING A TYPICAL SHIFT?

WHAT SORT OF TASKS ARE REQUIRED DURING A TYPICAL CALL?

WHAT ARE SOME OF THE THINGS THAT YOU'RE THINKING OR TALKING ABOUT WITH YOUR PARTNER ON THE WAY TO THE SCENE?

HOW OFTEN ARE YOU PAIRED UP WITH THE SAME PERSON?

        HOW DOES THAT AFFECT COMMUNICATION OR TEAMWORK?

DURING A TYPICAL RUN, HOW ARE TASKS USUALLY DIVIDED UP BETWEEN YOU AND YOUR PARTNER?

CAN YOU DESCRIBE TASKS THAT ARE BETTER DONE BY TWO PEOPLE INSTEAD OF JUST ONE?

WHAT MAKES FOR AN IDEAL OR "BEST" PARTNER?

HOW OFTEN ARE THERE DISAGREEMENTS ABOUT WHAT SHOULD BE DONE?

WHEN YOU'RE ON THE WAY TO THE HOSPITAL, WHAT SORT OF THINGS ARE YOU THINKING/DOING?

CAN YOU DESCRIBE A TYPICAL INTERACTION BETWEEN THE EMS CREW AND THE HOSPITAL STAFF?

WHAT SORT OF THINGS MAKE THE HANDOFF OF PATIENT CARE GO SMOOTHLY?

CAN YOU SHARE ANY STORIES ABOUT SITUATIONS WHEN THE INTERACTION DIDN'T GO AS PLANNED?

WHAT SORT OF THINGS HAPPEN AFTER YOU'VE HANDED OFF THE PATIENT AT THE HOSPITAL & YOU'RE ON YOUR WAY BACK TO THE STATION?

IS THERE ANYTHING I'VE MISSED?

Appendix A (Cont.) Interview Protocol for Officers

I'D LIKE TO THANK YOU FOR PARTICIPATING IN THIS STUDY.

FIRST OFF, JUST A FEW DEMOGRAPHIC QUESTIONS:

1)   PROFESSIONAL CERTIFICATION (EMT vs. PARAMEDIC)

2)   RANK (FIREFIGHTER, EO, CAPTAIN, SENIOR CAPTAIN, ETC)

3)   YEARS OF EXPERIENCE?

4)   MALE/FEMALE

I UNDERSTAND THAT OFFICERS LIKE YOURSELF ARE RESPONSIBLE FOR RUNNING THE FIRE STATION…. IS THAT RIGHT?

WHAT IS THE ROLE OF THE CAPTAIN (OR EMS SUPERVISOR) IN THE FIRE DEPARTMENT?

I'M TOLD THAT FIRE CAPTAINS GET CALLED TO RESPOND UNDER CERTAIN SPECIFIC SITUATIONS. CAN YOU WALK ME THROUGH A TYPICAL SITUATION WHEN A FIRE CAPTAIN WOULD BE CALLED TO RESPOND?

WHAT TRIGGERS A CALL FOR A CAPTAIN (OR EMS SUPERVISOR, ETC)?

WHAT SORT OF TASKS ARE REQUIRED OF A CAPTAIN DURING A MEDICAL CASE?

WHAT ARE SOME OF THE THINGS THAT YOU'RE THINKING ABOUT ON THE WAY TO THE SCENE OF A CRITICAL EVENT?

HOW DO TASKS DURING A CRITICAL EVENT USUALLY GET DIVIDED UP?

IN TERMS OF SERIOUS MEDICAL CALLS (E.G., MULTI-CAR COLLISION), CAN YOU DESCRIBE TASKS THAT ARE BETTER DONE BY MORE THAN ONE PERSON INSTEAD OF JUST ONE?

IN TERMS OF FIREFIGHTING, WHAT SORT OF TASKS ARE BEST DONE BY MORE THAN ONE PERSON?

IN YOUR ROLE, WHAT MAKES YOUR JOB MANAGING A CRITICAL EVENT (E.G., MULTI CAR COLLISION, PUTTING OUT A FIRE, ETC) GO MORE SMOOTHLY?

HOW IMPORTANT IS COORDINATION ON THE SCENE OF A CRITICAL EVENT?

HOW DO YOU GET DIFFERENT PERSONNEL TO COORDINATE EFFECTIVELY?

IN TERMS OF EMS, IN YOUR EXPERIENCE, WHAT MAKES FOR AN IDEAL OR "BEST" PARTNER ON AN AMBULANCE?

HOW ARE DISAGREEMENTS BETWEEN PARTNERS WORKED OUT?

WHEN YOU SEE A HIGHLY EFFECTIVE TEAM, WHAT CHARACTERISTICS MAKE THEM FUNCTION SO WELL TOGETHER?

ALTERNATIVELY, WHAT CHARACTERISTICS MAKE FOR AN INEFFECTIVE TEAM?

WHAT CAN SENIOR LEADERSHIP/MANAGEMENT DO TO PROMOTE TEAMWORK?

IS THERE ANYTHING I'VE MISSED?

Appendix B: Summary of Quotes

Action Processes

Monitoring Progress

Definition: Tracking progress toward goal accomplishment and transmitting this information to team members

Quote: "So then we get on scene, we try to identify who's in command, and then see what role he gives us when we get on scene, which more than likely if there's already units there we're going to be kind of triage or transport, and then we just assume those roles.... and then, like I said, we sort out the most critical patients and if we needed transport we transport or triage on scene or do we just sort 'em out for other units to come by and pick them up." (R 17, Firefighter-Paramedic)

Quote: "As the in-charge [provider on scene], I think, on the ambulance, I would be still dealing directly with the patient to figure out what's going on, what's hurting, and whether I'm taking care of that, or depending on what's wrong with him... and making sure that everything is managed there." (R 7, Firefighter-EMT)

Systems Monitoring

Definition: Tracking changes in team resources and environment

Quote: "Number one is scene safety. It should be scene safety, and you find out your conditions what you're going to be doing and then what resources are going to be needed. And then you work off of that we kind of work off of the CAN: conditions, actions, needs, and then you request additional resources if needed or you just to set the scene the situation the patients and determine their acuity and determine extrication, or determine which hospital will be transported to do to the level of care needed." (R 3, EMS Supervisor)

Quote: "So once we pull up onto the scene, then, we make a first, um, make a scene assessment, we're looking for, ah, any hazards… such as traffic…. is there heavy traffic in the area? Do we have to block additional lanes of traffic for our safety as well? Do we… Are there any power poles involved, and kinds of electricity that may be involved… may be touching the vehicle?   We also look for fires, or any kinds of fluid leaking that's coming from the vehicle. We try to identify if there's another vehicle, or any other patients that may be out walking around. And this is all prior to exiting the ambulance." (R 2, Engineer Operator-EMT)

Team Monitoring & Backup

Definition: Helping other team members perform tasks through verbal coaching, behavioral assistance, or completing a task for the teammate

Quote "If there's a list of A through E that needs to be done for, let's say a roll over, I automatically know I can jump in and do A, somebody else can jump in and do B, somebody else can jump in and do C. And the captains can kinda sit back and be an incident command, and look at the big picture and make sure things are going right and he's not having to micro manage and so, uh, again your kind of working off of a cohesive situation where we all know essentially what needs to be done and if one person is doing something else, the other person can just immediately jump in and do the other without having to give instructions and all, and it just makes for, it's better for everybody. For the patient, for the safety of the firefighters, it's, ah.... it's pretty critical" (R 05, Firefighter-EMT)

Quote: "[How are the tasks on a 911 call divided?] Well let's see, so my partner he is considered the 'in-charge' paramedic, and since I'm the EOP [engineer operator-paramedic]. I'm sort of there, not only as a support person for him, but I'm also there to take tasks away from him so that he can concentrate on the assessment itself. I'll give you an example: if it's just he and I responding without any help from pumpers or another ambulance or stuff, he knows he can get on scene and start talking to the patient while I will immediately go and take a set of vitals and I'll start working on an EKG and then that way he doesn't have to worry about doing all that by himself, and he can worry about talking to the patient, figuring out what's going on, and at the same time, I'm listening for what he saying and I'm listening to what the patient saying, so that we'll both know what's going on. But I'm taking those tasks away from him, so that he doesn't have to worry about them, and we have an understanding to where he knows I'm going to do it, so he doesn't have to worry about it." (R 17, Engineer Operator-Paramedic)

Coordination

Definition: Managing the sequence and timing of the taskwork

Quote: "Well, I do the actual hands on stuff. He'll do the stretcher. And I'll call it in. and, ah, he'll also enter in the patient demographics. And we also ask questions umm, back and forth, sometimes. Or else he'll take over, or I'll take over." (R 1, Firefighter-EMT)

Quote: "I think we should divide up the tasks equally.... so I try take as much work off my partner as possible, to the point of dividing the work up evenly. So, I I as my partner is actually physically touching the patient, and gathering a blood pressure, a temp strip, a pulse, I'm writing down and recording all the information possible, um, for getting the detailed history, recording that detailed history as well, for getting the medications, I'm trying to

gather the medications, put 'em in a bag, maybe, um, get some identification, while my partner's taking care of other parts of the scene." (R 2, Engineer Operator-EMT)

Quote: "Everybody's got a specific role to begin with.... usually the in-charge on the ambulance is going to be the one who is, kind of determining what needs to happen.. I guess the roles could change, because, for example, if the pumper got there first, they're the ones that are doing the C-collar, and talking to the patient, and then, if I come in on an ambulance after we pull out in front.... I'm not going to take over for what he's doing. I'm just going to go back to another role.... I wouldn't say nobody's going to get bent out of shape if someone's doing their job. They just.... there's always something else to do. (R 07, Firefighter-EMT)

Interpersonal Processes

Conflict Management

Definition: Processes that reveal and/or address team conflict

Quote: "If there is a disagreement, for instance, to give you an example, if there is a case that I feel needs to be transported and my partner feels otherwise how usually tell him I think I'll start off at the lowest level all say 'Hey listen I think we need to transport this one', and if you resist or is stubborn about it and say, 'No, I'm not going to do it' or whatever, usually I'll say in that case, 'Why don't you drive, and I will do all the patient care, and we'll talk about it afterwards'. After the fact, we talked about it and we both express at our sides or our opinions about it and hopefully come to a cordial resolution which most of the time happens. Very seldom will somebody be upset about it and just continue screaming." (R 17, Engineer Operator-Paramedic) "

Quote: "I will not call out my partner in front of the patient or the surrounding, umm, citizens, or the... additional fire apparatus, or EMS apparatus that are there. I may pull them off to the side, or whisper in their ear, "hey lets go down this road", or "what do you think about this particular issue here", if they catch something that I haven't caught or make a decision in a different direction than what I was thinking…. I'll ask them, "Where are we going with this?" and if they don't give me some good substantial reasons based on training and experience, then I may say, "Hey, is that the right direction to go?" I never make a huge issue on the scene." (R 2, Engineer Operator-EMT)

Motivation/Confidence Building

Definition: Practices that build the team's confidence and/or motivation

"Quote: "[How does the schedule promote team effectiveness?] I think in the form of Team effectiveness, It's kind of cliché and people use the phrase all the time but you kind of are a

big family. You know we go to the grocery store together we cook together we clean together we work out together. I think when you're doing that much stuff as a team it promotes teamwork and team cohesion. So I think it's a good thing."" (R 16, Fire Captain) "

Quote: "A highly effective team is generally led by an officer who has motivated their crew, who embraces ALL aspects of the job, that doesn't denigrate any portion of the job, because they personally don't care for it. They successful crew is led by a good officer. The officer sets the tone. So if you have an officer who bad mouths EMS who cusses every time he has to go out and make an EMS run, that's going to be reflected not only in the crew and their response times, but it's reflected in their patient care. So it starts with the officer and it trickles down from there" (R 6, EMS Supervisor)

Affect Management

Definition: Practices that involve regulating team members' emotions

Quote: "[What happens after you've dropped a patient off at the hospital?]   A lot of times we just BS… you know, we're just talking. It's very rare that we carry that incident with us once we leave them at the hospital. I know for myself it doesn't take long for me to forget whatever I've seen or done. It's just you kind of learn to turn it off, I suppose. You learn to turn your emotions off so that once I'm done with that you know I've done my job and I learned a long time ago that separate my emotion from it, well from most of the calls, anyhow. I know for me, the only [cases] that really usually stay with me, and maybe we'll talk about a little bit, are usually the ones that have to do with kids, or maybe elderly people. But it's usually just kids. And sometimes we'll talk about it a little bit. Fireman don't... or guys that have some time, they don't carry it with them. You learn to disconnect and to do your job and disconnect emotionally, and then once you're done with it like you said you're ready to turn the page." (R-5, Firefighter-EMT).

Quote: "[What can be done to maintain good teamwork and communication?] Not allow the [external] barriers, or the outer communications [external to your crew] to affect your day-to-day operations. And not to let the politics and the bureaucracy get to you. And come to work and do a hundred percent and that would help a lot." (R-3, EMS Supervisor).

Quote: "[What makes for an ideal or best partner?] A lot of it is attitude. Somebody who is happy to come to work who doesn't complain who enjoys his job. That's what it's all about. I can work with anybody who has a decent attitude like that, you know. I can, for example, a rookie.... I can teach a rookie whatever we need to teach him, but if he's got a crappy attitude, it's hard to work with. So I'd say attitude is the biggest thing." (R 16, Fire Captain).

Planning Processes

Mission Analysis

Definition: Interpretation and evaluation of the team's mission, consideration of the team's environment, and needed resources

Quote: "Since I'm an EMS supervisor it's my responsibility if I'm dispatched to gather as much information and try and play a traffic controller and gather all the information and then utilize it and come up with the action plan." (Respondent (R) 3, EMS Supervisor)

Quote: "Well if it's an EMS call, there's just two of us in the squad which I'm on now, and we look at the car note on the screen we'll look at the address, go over the call and if we see anything special like breathing problem or if it's a cardiac arrest, y'know, we talk about things real quick." (R 10, Firefighter-Paramedic)

Goal Specification

Definition: Identification and prioritization of goals

Quote: "I'm usually in charge of a scene like that, um, and um, y'know, number one thing it's just to make sure that our scene is safe, like I said, if we need any additional personnel... normally will also require P.D. [police department] just for traffic control or any other situation that we would need them for. But if it's a multi-vehicle, I'm going to just pretty much assess any patients, um, prioritize 'em, just to make sure that… I'll also have a partner, um, an EO, the driver, he will assist me in assessing patients. We'll go from there... I mean it's kind of…. we'll just go for the patients we have... we're going to treat them based on the severity of injuries they have, and whatnot." (R 8, Firefighter-Paramedic)

Quote: "With a partner that I know, but even with the ones I don't know, I generally try to make sure that we talk and gets our groundwork laid out between us for our more common runs or things that we encounter during a shift" (R 20, Engineer Operator-Paramedic)

Strategy Formulation

Definition: Developing plans for how the team will accomplish its goals within situational and time constraints

Quote: "Once we get all of those notes, we kind of my partner and I, we kind of formulate what we're gonna... we know what our roles are, and we're going to kind of formulate what each one of us is going to undertake as soon as we get on scene such as…. are we gonna triage real quick, or assist other units that are on scene and triaging, and try to figure out, depending on how soon we arrived whether we are the first EMS unit to arrive, or the second or third, you know, we gotta try to sort out the most critical patients and take care of

those for transport. So we do that on the way we talk about it we talk about the worst case scenario, and anything less than that is even better." (R 17, Firefighter-Paramedic)

Quote: "Most of the time, my EO and I, we go over, like, with the scenario that we've been given, we'll talk about it on the way there, Um, and do "what if's" and stuff like that." (R 1, Firefighter-EMT)

Reflection Processes

Debriefing/Decompressing

Definition: A retrospective analysis of goal-oriented actions that have recently been undertaken; also, the post-task reflection iterative activities which helps to alleviate nervous tension or anxiety relating to such tasks

Quote: "After he's done with [his charting at the end of a call], and after I'm done with my part, I'm always thinking about what we could have done better. How did things go and what could we have done better. And my partner is usually pretty good about thinking about those sorts of things also and so once he's done with his part and I'm done with my part we meet up at the unit again in the front cab and we talked about it. We talked about things that might not have gone our way or things that we're perfect and we want to repeat that again the next round if we have one like it and we do a self-critique. We... I asked him is there anything I could have done better for you and he does the same thing and then we talked we talked things back and forth like that and we talked about what the First Responders on scene did for us or didn't do for us or what they could have done better or what we can do to make up for their deficits on same. Because a lot of times they're not the most helpful individuals and we have to make up for what they are not doing for us. Things like that and then once we do that, we take a breather and we head on down to the next one." (R 17, Engineer Operator-Paramedic)

Quote: "A lot of times we'll talk about the call armchair quarterback or Monday morning quarterbacking could we do anything different is there anything that we missed sometimes will follow up with the hospital after the fact to see or confirm what we thought might be going on to find out if it's true or maybe it was something completely different" (R 15, Firefighter-Paramedic)

Miscellaneous

Team Design

Definition: Information about how the organization is organized, staffed, trained, equipped, or managed.

Quote: "[As a Captain, are you assigned to a specific apparatus or do you run are you basically in charge of a fire station?] Well, both. I'm assigned to engine xx but I'm also in charge of station xx" (R 16, Fire Captain).

Quote: "[What is the role of the captain in the fire department?] Well I guess you could split it into two different sides: there is the emergency response side where you're responsible for your four-man crew, making the decisions, deciding whether it's safe or unsafe to enter, your tactics on EMS scenes, how... especially me being a paramedic, a little bit more is on my shoulders 'cuz most guys are EMTs, so decision about patient care being a captain, I don't do a lot of Hands-On stuff anymore, I'm more delegate to my guys. That's one side of it. As emergency response side. Now you got your daily station life side and there are you have responsible for making sure that all the records get done, and the station is clean, supplies get ordered, and training gets entered, and training gets conducted, and all of those administrative kinds of things." (R 16, Fire Captain).

Leadership

Definition: The ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, motivate team members, plan and organize, and establish a positive atmosphere

Quote: "A highly effective team is generally led by an officer who is motivated, who embraces all aspects of the job, that doesn't denigrate any portion of the job, because they personally don't care for it. The successful crew is led by a good officer. The officer sets the tone. So if you have an officer who bad mouths EMS who cusses every time he has to go out and make an EMS run, that's going to be reflected not only in the crew and their response times, but it's reflected in their patient care. So it starts with the officer and it trickles down from there. So when you have an effective team, it's because you have a team that talks at the station, they have an officer that has an open communication policy, that also make sure his team is doing what they need to do whether they like it or not. It may not be the most fun part of the job like 84% of our job" (R 6, EMS Supervisor)

Quote: "The shoot-from-the-hip description on how I handle large incidents or any incidents I'm involved in.... I think [an example is the] span of control that I can comfortably handle is about 7 people answering to me and I try and divide the incident into manageable chunks where I have perhaps seven officers underneath me they have perhaps seven people responding underneath them and I try to break up the large incident whether it's a high-rise fire or a warehouse fire or multi-casualty incident into manageable sections that people under stress can deal with effectively .Sort of a divide-and-conquer situation if that makes any sense." (R 11, District Chief)

Shared Mental Model

Definition: An organized understanding of relevant team-based knowledge that is shared by team members, which is an antecedent to effective team performance.

Quote: " I think a lot times if you have a good working relationship with your officer and you work with them for a period of time and then your other crew members, a lot of times, um, like I had said earlier, you know each other's strengths and weaknesses and you can work off of that without even having to always communicate directly. Or if we all are on the same page with how our officer operates on a scene then he doesn't always have to micro manage. We all know what the expectations are we all know what needs to be done." (R 05, Firefighter-Paramedic)

Quote: ""How does being with your same partner affect teamwork?] I've noticed when I work with other people, maybe it's not as smooth, say if we make a cardiac arrest call, because you know I've gotten to a point where I can read my partner, you know, with nonverbal cues, and when it's with someone else, we kind of have to... I don't know, it just seems like there's more hiccups involved.... maybe it's not a smooth, although we should be following the same protocol, it should be kind of the same process for each each of our calls. But once you've developed history, and have experience with the same person over and over, you kind of already know what to expect." (R 08, Firefighter-Paramedic)"

Quote: "My ideal teammate.... my last partner, was probably my idea partner. I didn't have to talk to him we can walk onto the scene and I wouldn't have to talk to him I wouldn't have to say a thing and he knew exactly what I was thinking and I knew what he was thinking. And we could work a cardiac arrest for a trauma patient or whatever without saying a word to each other. He just knew what was next, and just like me, I know what he was thinking, and what was he was going to want next he knew what I was going to want next." (R 32, EMS Supervisor)

Procedural Knowledge

Definition: The knowledge exercised in the performance of a specific occupational task

Quote: "[What makes for an ideal partner?] Basically someone who knows the protocol. That's pretty much all I base it on." (R 01, Firefighter-EMT).

Quote: "For example, my current partner I work with the reason why I wanted to work with him is because he has a very good knowledge of the job and the protocols he's very experienced and when it comes to critical patients if we get orders for something that maybe is not in the protocol something that we need orders for before I know if he's on the phone I'm taking care of the patient and will have orders before you know it and we're good to go and we start heading to the hospital we're very fast and efficient." (R 04, Firefighter-Paramedic).

Quote: "If personnel aren't trained then, well, you can tell him to do something all day, but if they don't know how to do it, then you have to take your time to instruct. But that's not the time, under duress, you know, something with life and death in those moments, it's not the time to instruct. You can direct, but it's not the same as instruct. Direction and instruction.... it's not the same thing. You can't, in an orchestra.... the conductor doesn't teach the tuba player how to play the tuba." (R 09, Senior Fire Captain).

Quote: "[What makes a good partner?] When it is time to do something, if it's a critical patient, someone that knows their job and how to do it well". (R 20, Engineer Operator-Paramedic)

Quote: "[What makes for an ineffective team?] Probably the main thing would be complacency... guys just not knowing their protocols, or what they're capable of, or what they should be capable of. Job knowledge, and I could say the reverse and say lack of experience also." (R 30, Fire Captain)"

Quote: "We are really fortunate, at least I'm real fortunate, in that area... most of my captains in that area that I deal with, and most of the captains that work with me, really know their job and know what they're supposed to do. So usually if I ask them to do something they know what it means, they know what they're supposed to do, and they get it done. And if they have a question, they won't hesitate to ask me. They know that they can ask me anything and I'd rather be asked a question and tell them what I need versus them not asking." (R 32, EMS Supervisor)

Interpersonal Trust

Definition: A psychological state comprising the sense of security, and the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another.

Quote: "Ideally, what I would want is to have the truck crew and the pumper from my station dispatched to that incident. I would want to work with my officer and my crew on something like that because I know how my Captain thinks I know how my crew operates. and so there's a level of comfort for me, and feeling like things are going to get done right. If I'm working with my crew. If it's other stations, other crews that I don't know, it's a little bit different. I know in one part of one of the things that comes to mind is my captain trusts me. I have a good relationship with my officers so I... there's not a situation where, they have to micro manage everything that goes on. We've all worked together for a long time, we all trust each other we all work together, so it's a lot more cohesive situation there. If you have different crews from different stations that don't know each other, it doesn't always move that smoothly." (R 05, Firefighter-EMT)

Quote: "I think really these guys will follow you off the edge of a cliff if you if they feel they can trust you.... If they feel confident in you, if they feel you have their best interests in mind, they will do whatever for you to bend over backwards." (R 16, Fire Captain)

Team Cohesion

Definition: The affective attraction to a team, its goals, as well as the desire to remain part of the team

Quote: "Our schedule, unlike in a typical business [where] you're only there maybe 10 hours... you're there for 24 hours, and you work together for a longer period, so you're able to see all different parts of that person. You're able to see all of their different parts... It helps to build that team, and get to know each other, you're there together with that partner, or with that crew, or those individuals within your sector for 24 hour. So you have a longer, a better opportunity to get to know each other." (R 25, EMS Supervisor)

Quote: "One thing I learned in the Marine Corps we are all one color. We are all green. There ain't no black, no white, and no brown, we are all green. And that has been my motto in the fire department we are all blue... we are all one color we all have the same objectives, which is patient care, or protection of property and lives.... You have to train, you have to make calls, you have to make calls for people that call for dumb stuff, you have to make the serious calls, you have to take care of dead babies in the middle of the night.... that kind of stuff...We have to believe, and have some type of cohesion, because one day we might die together. And that is the harsh reality of our job, we might die together. It's nothing more truer than that that... If you don't understand that concept you don't belong on this job." (R 26, Fire Captain)

Quote: "I think as far as working the hours that we do, making runs at all hours of the night, um, y'know, the fatigue that can happen.... I think it builds a closer bond for the most part. Crew integrity and so forth, the guys are in it together, they're up at 3 a.m. transporting a a minor situation... 'Why am I really up at 3 a.m. transporting this patient'? You're kind of, you know, I don't think there's as much crew integrity, and partner Integrity, when you work 12 hours, everyone's ready to go their own way, but when you got to stick it out through the night to the towers I think I can make it closer." (R 30, Fire Captain)

Crew Familiarity/Crew Consistency

Definition: Derives from an aspect of team design (i.e., the employee schedule) in which teams maintain a consistent schedule with one another over time

Quote: "I think a lot times if you have a good working relationship with your officer and you work with them for a period of time and then your other crew members, a lot of times, um,

like I had said earlier, you know each other's strengths and weaknesses and you can work off of that without even having to always communicate directly" (R 05, Firefighter-EMT)

Quote: "[How do people get assigned together?]... We bid for a position, a particular position, and once we bid for that position, we bid for an ambulance or an apparatus, and if you're awarded the bid for the ambulance, then you are assigned to that ambulance for at least one year of time. So, yes, that is correct. We are assigned to the ambulance, at least for one year. Typically within the Houston Fire Dept, you have to be assigned to the ambulance for about 2 years prior to enough seniority and transferring from an ambulance to an engine or a ladder." (R 02, Engineer Operator-EMT)

Quote: "Not knowing your partner makes it very difficult um, day to day, and some of the reasons are the dynamics not only what's going on at home with that person, whether it may be some marital problems, whether your partner may be moving into y'know a new home, whether they're having problems with their mom & dad, um, they might have had some issues with their children, um, whatever it may be. So someone who is partnered consistently together, you can, you know day to day what's going on, you have a relationship, and you understand the dynamics of what's going on behind the scene, which in turn makes a 24 hour shift a lot easier to navigate and to navigate the easy calls, and even to navigate the bad calls.... So, um, being paired up with the same partner, I think, personally would make the shift a lot easier, would make our emotions and dealing with those emotions a lot better, our psychiatric health as well on calls a lot easier as well." (R 2, Engineer Operator-EMT).

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