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**Situational Awareness in Multi-Casualty Incidents:
Theory Development from the Field**

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Steven T. Busby
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Abstract

The purpose of this study was to understand the process of situational awareness (SA) in multi-casualty incidents (MCI). This study is significant because SA provides information on which critical decisions are made during emergency events. The literature concerning SA is mostly drawn from the domains of aviation, military operations and business and not nursing. Current conceptual and theoretical development is insufficient for application to the domain of MCI. MCI occur daily across the United States, yet a literature review revealed no studies involving SA in MCI. Limited issues that are possibly related to SA in MCI have been researched such as triage, scene safety and patient disposition, but none identify or integrate concepts important to SA.

The lack of developed theory in this domain, led to a grounded theory approach to explore, identify and relate concepts that emerged from the data in order to uncover the process of SA. Interview transcripts from 15 emergency responders constituted the bulk of the data. Participants had various professional roles and diverse experiential levels. The data were managed using the software program NVivo 8.

Findings suggested that “establishing and maintaining control” of the scene was the core category, with other categories interacting with and being mediated by this core. Rescuers, given experiential and educational preparation responded to contextually-based situations. By appreciating the context and complexity of the event, rescuers handled information, managed resources, used roles and relationships and dealt with the emotional responses to the actions and interactions on the scene to establish and maintain control of the situation. By establishing and maintaining control, rescuers provided a

relatively safe environment in which to provide emergency healthcare. The substantive theory, the “Busby Theory of Situational Awareness in Multi-Casualty Incidents” resulted from this study.

Future research should refine this model with eventual theory testing. This theory may prove beneficial in studying larger-scale events, such as mass-casualty situations and disasters and possibly different managerial hierarchies related to emergency response efforts. It should also serve as an educational tool for emergency responders and may prove helpful in the clinical practice of emergency responders from diverse disciplines.

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CHAPTER ONE

Introduction

Imagine two emergency workers in an ambulance hearing the crackle of a call coming over their radio. The dispatcher advises them that there is a multi-vehicle accident and a passerby reports that one vehicle is on fire. No more details are known at this time. As the crew races through the city, different scenarios are running through their minds. When they arrive on the scene, they see that a fire crew has extinguished the blaze and is feverishly caring for a critical patient who is trapped in the previously burning car. As they are taking in the scene, they hear the loud whir of a medical helicopter above, and they see two people with obvious injuries sitting on the ground waiting for help. A police officer is directing traffic and the fire captain comes over to update the arriving emergency workers on the situation.

The possible scenarios they were mulling over now turn into assessable data. How many vehicles and people are involved? How serious are the injuries? Will they need additional units? Are there electrical power lines down? Are rescuers at risk? These thoughts they are having are not random anxiety-induced concerns. They are the contemplations of experienced providers. They are considering the possibilities, many times based on pattern-matched past experiences, with the intent of compiling and processing information for use in critical decision-making. These responders may have never utilized, or even heard the term “situational awareness”, nevertheless they are developing it.

Situational (or situation) awareness (SA) is an important concept to understand in the management of multi-casualty incidents (MCI), including small and large-scale incidents, and can have a serious impact on public health on a daily basis. In this chapter, I will briefly describe SA and its application to multi-casualty incidents, introduce the research problem and question, discuss the significance and utility of the concept of SA to healthcare delivery and nursing, and provide some important conceptual definitions. Finally, I will introduce the philosophical orientation and the research assumptions derived from that orientation and provide the limitations and delimitations of the study.

Endsley (1996, p. 159) referred to SA as a “mental model of the current state of a dynamic environment.” The word “dynamic” indicates constant actual or potential for change. Therefore knowledge about a situation is virtually never terminal as long as the situation is ongoing. Situational Awareness is a concept composed of many sub-concepts or categories. SA is used to determine what is happening in a particular set of circumstances for the purpose of projecting possible outcomes and thus action to be taken. Grasping exactly what constitutes SA is in large part a function of the particular circumstances in which it is being developed. SA has been studied mostly with regard to aviation, but has also been investigated with regard to business and industry, military operations, and others. SA has been described both as a product, or the knowledge about a situation at any given time within a critical activity, and a process of how that information develops. Both descriptions are critical to understanding how SA may be utilized for the benefit of those on whose behalf decisions are being made.

Multi-casualty incidents, emergency events endangering more than one patient at a time, occur daily around the nation. Yet little can be found in the literature with regard to the application of SA to multi-casualty situations. Application of the principles of SA to multi-casualty incidents may improve the care provided in these situations, and lead to a better understanding of larger scale events in the future. The time has come to further explore this concept and its potential impact on public health; especially in an era where MCIs and even larger-scale events are ever looming.

Research Problem

SA is critical to multi-casualty incidents that occur daily nationwide. Yet SA in MCI has not been studied or widely written about in the literature. A search of common healthcare databases revealed one article that explicitly included situational awareness and either multi or mass casualty in the title (Demchak, Chan, Griswold & Lenert, 2006). That article involved mass, not multi-casualty incidents. Early, accurate SA development can have beneficial effects on the management of multi-casualty incidents. However, the process by which SA develops, its subsequent categories, properties, and the dimensions of those properties and the usefulness of SA in MCI are not clearly understood.

Literature includes concepts such as triage, patient disposition, scene safety, the need for communications and terms like scene size-up (Augustine, 2006; Cotter, 2006; Johnson & Calkins, 1999; Limmer, Mistovich & Krost, 2006; Zoraster, Chidester & Koenig, 2007). In addition, on a more macro-level, courses such as Advanced Disaster Life Support (ADLS) offer acronyms such as d-i-s-a-s-t-e-r. The letters stand for detect, incident command, support, all-hazards approach, scene safety, transport, evacuation,

recovery (American Medical Association & National Disaster Life Support Foundation, 2004). These are clearly pieces of information that constitute the essence of SA, but do not describe it entirely. What we do not know is how SA develops, what factors facilitate or hinder development of SA, and if the timing of those particular happenings matters. These questions require answers.

The problem driving this research project was that there is little if any literature concerning the process of SA development in multi-casualty incidents. The process of SA development uncovered in this study may inform SA development in disaster situations. However, SA development in disasters may be quite different than that found in multi-casualty incidents. The purpose of this study was to determine the process of individual SA development in multi-casualty incidents from the perspective of the emergency responder. Grounded theory methodology was used to develop a theory of situational Awareness in Multi-Casualty Incidents for this study.

Research Question

The purpose of the study was to uncover the process of situational awareness in multi-casualty incidents. Therefore, the research question was:

What is the process of individual situational awareness development in multi-casualty incidents?

The resulting theory that emerged from this study enlightens our understanding of situational awareness in multi-casualty incidents.

Significance to Healthcare Delivery and Nursing

SA has utility for healthcare delivery in general and nursing specifically. The study of multi-casualty incidents affects most healthcare workers, since they will be involved at some point in the process of caring for patients. SA affects every aspect of a multi-casualty scene. Nurses are becoming ever more involved in all types of healthcare including that provided in the field. Development of the science of SA in relation to nursing is important to me as a nurse, and I believe, the profession of nursing as a whole.

Healthcare

Situational awareness is critical for healthcare delivery, because it is necessary if appropriate decisions are to be made. This is true for emergency events both large and small. In addition, the highly complex environments in which healthcare provision occurs require a high level of SA. Adequate SA in these multi-dimensional situations also depends on the adequate perception and comprehension of information that can be used for good decision-making.

SA can be applied generally to healthcare in a variety of circumstances. An operating room, an ICU, the scene of a motor vehicle accident, a natural disaster, or a terrorist event would all be examples of situations in which SA development would clearly be applicable. Reports of the application of SA to healthcare situations in the literature is limited. With regard to multi-casualty incidents, it is non-existent. Because of the complex nature of multi-casualty incidents, the numbers of patients involved, and the numbers and types of healthcare providers involved, accurate development of SA is important yet not addressed adequately in MCI literature. The nature of the times in

which we live is also a compelling factor for the development of accurate, actionable information for the purposes of health care. Natural disasters, terrorist events and everyday community emergency incidents could be more effectively addressed if healthcare workers had a better understanding of SA and its application.

Nursing

It is critical for nurses to have an understanding of the process and product of SA. This knowledge has particular salience for nurses in the 21st century. Gathering and processing data is important for all aspects of nursing care. Therefore, SA has implications for nurses in all settings, not just emergency preparedness.

Nursing is the largest single healthcare discipline in the country (The Nursing Shortage, 2001). When one considers the fact that there is virtually nothing accomplished in healthcare today that can be done without the input of a nurse at least somewhere along the way, the importance of nurses to anything remotely related to “healthcare” becomes undeniable. We now have nurses heavily involved in the political process. This involvement cannot be considered direct patient care, but it does affect how care is delivered. In the same way, a nurse’s understanding of the development of SA in multi-casualty situations may be at times indirectly and at other times directly related to the care that the nurse provides.

Nurses also have a unique healthcare perspective. We are experts in advocacy, care management, leadership, patient and family education, multi-disciplinary coordination and many other areas necessary for the provision of healthcare. In many hospitals, the case managers are nurses.

Nurses currently use a form of SA, when they use the acronym SBAR (Situation, Background, Assessment, Recommendation). SBAR represents information for reporting to each other, physicians and other healthcare providers (Guise, 2006; Rodgers, 2007). It is a way of appreciating a situation, making sense of the assessment, and making a recommendation concerning the patient's care. Advanced practice nurses have additional skills that may be of benefit in multi-casualty situations, including knowledge about some aspects of the medical model that may be of use particularly under the circumstances of MCI.

While multi-casualty victims may be initially treated outside of hospitals, the care that they receive is virtually never devoid of nursing care. Emergency medical services providers typically provide the initial healthcare to victims outside of a healthcare facility. However, they will in many cases have radio communications with, and will certainly deliver their patients into the care of nurses. Additionally, some nurses do respond to multi-casualty incidents as part of EMS teams or flight crews. Some healthcare providers today are being cross-trained as EMS providers and nurses.

Many nurses returning for graduate education, are currently, or have been, past EMS providers. The literature reveals several examples of joint training between nurses and EMS providers, and even nurses training EMS workers for their primary roles (Dufflin, 2005; Horrocks, 2004; Jenkin & Endacott, 2002; Melby, 2000; RNs Can Participate, 2005).

Nurses' (and nursing students') intuition, information processing, and decision-making have been the focus of multiple naturalistic inquiries (Brooks & Thomas, 1997; Crandall & Getchell-Reiter, 1993). Those studies also inform this research project.

We live in a global community and on some level this fact will affect all that we do, including healthcare delivery. As healthcare personnel attempt to deal with issues such as large-scale natural disasters and terrorism, providers from different countries will need to collaborate if comprehensive solutions to these issues are to be found. In doing so, all aspects of healthcare will need to be included. In some countries, such as England and Australia, it is commonplace for nurses to respond to multi-casualty scenes with ambulance personnel. In several articles, authors discussed "ambulance nursing" which occurs mostly in European countries (Suserud, Bruce, & Dahlberg, 2003a; Suserud, Bruce & Dahlberg, 2003b; Suserud & Bruce, 2003). Therefore, the placement of multi-casualty SA development should not be excluded from nursing epistemology. If nurses are to be at the planning table in terms of preparation for multi-casualty and larger scale incidents, they must have an understanding of SA and other important issues that may not be presented in basic nursing educational programs.

For too long, nurses have been seen by some as having a limited scope of practice with little decision-making ability. It is necessary for nurses to have increasing influence in all aspects of healthcare delivery. The status of nurses is changing from bed-side caregivers to high-level decision makers. These changes are slow to come (Mechanic & Reinhard, 2002), but are seen in articles such as that offered by Anderson and Rorty (2001) referring to international stances taken by nurses on issues such as ethics,

genetics, and other public policy needs such as those concerning emergency preparedness (Public Health Policy, 2004). Nursing has much to offer all types of healthcare including emergency preparedness. Therefore, the future of nursing must include an understanding of why and how nurses should be involved in emergency preparedness and the contributions that nursing can make to management of multi-casualty incidents, including SA.

Concepts and Definitions

Situational Awareness

Although there is not clear agreement on the definition of SA, one is cited more frequently than others. Endsley (1988, 1995a, p. 36) began developing her conceptualization of SA in the mid-1980s and she states that SA is “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future.” At the core of this definition are the concepts of perception, comprehension and projection.

Endsley’s definition is highly descriptive and useful; however there may be some components that are necessary for application to circumstances concerning healthcare delivery, such as MCI, that are not represented in her definition. Multi-casualty incidents may include a single event, or a series of events. In addition, not only response, but also planning is necessary for the accurate handling of emergency responses. Finally, though technology has increased the amount of information available, it is important to be able to determine what information among that which is available, is useful, and what is available but extraneous. These components and others are important aspects of

healthcare-driven SA. Discovery of a theory led to the development of a definition of SA in MCI that is presented in the chapter five.

“Experienced” Healthcare Providers

The eventual purpose of this study was to provide emergency workers with improved understanding of the process of SA development in MCI. “Experienced” healthcare providers have been found to make more rapid assessments and decisions than do novices (Klein, 1998, p. 4). These providers are also likely to be responsible for the decisions that result from the SA developed. It was felt that some minimum level of emergency response exposure was necessary. Among my participants, I chose to include providers with at least one year of professional response background. The views of less experienced responders were important and provided variation in the data. However, those with less than one year as responders may have very little familiarity with actual response efforts in MCI. Including only highly seasoned providers of, for example 10 years or more, could have over-estimated the capacity of providers to develop SA. Therefore, those with at least one year as responders with no upper limit of years of experience were included.

Multi-Casualty Incidents

For the purposes of this study, MCI was considered any incident that involved the need for healthcare delivery for between two and 25 persons as a result of an event or series of related events, occurring in an emergency field-level setting outside of a medical facility.

Individual SA is the concept of interest. Team SA is sufficiently different and is dealt with as such in literature. Individual SA, which contributes to team SA development, is antecedent to team SA and therefore requires explication.

Philosophical Orientation

Underlying this study is the philosophical paradigm of pragmatism as put forth by John Dewey (1929). This approach is important in that it allows practice to inform basic knowledge, and vice versa. All practice interactions occur between humans who live and operate within their own contextually-based reality. Because each person's particular reality is informed by his/her own personal interactions, a lens of symbolic interactionism, which provides the philosophical basis for grounded theory, was also used (Blumer, 1969).

I also employed the approach of naturalistic inquiry as discussed by Klein (1998) in *Sources of Power: How people make decisions*, and in *Naturalistic Inquiry* (Zsombok & Klein, 1997). Naturalistic decision-making and naturalistic inquiry were important to the study because the research aim was to uncover the process of SA development as the participant recalled it naturally occurring in real, not simulated situations. This approach permitted the essence of the process to emerge in a way it may not have if the process were being evaluated in a simulated situation.

Most actual measurement of SA has been done in controlled laboratory settings. This study illuminated the natural process with regard to not only determining what helped in SA development, but also, through the recollection and analysis of actual events, what did not.

Research Assumptions

The following assumptions were accepted by the researcher. Some related to the study with respect to design, while others pertained specifically to the methodology.

1. Pragmatism as a scientific philosophical stance allows for knowledge to inform practice and vice versa.
2. Practical application of research techniques to naturalistic settings provides unique insights into practice.
3. Meanings and word symbols are important in the interaction that occurs between individuals.
4. The development of SA, like other human interactions, requires the use of contextual meanings, and those meanings are developed and modified through human interaction.
5. The product of SA is insufficient on its own to determine the benefit of SA in multi-casualty incidents.
6. Process is separate from the product of SA, but also constitutes critical knowledge.
7. Process may be different in certain situations, but will have enough consistency within varied MCI and among providers to support transferability.
8. Responders to multi-casualty incidents are able to inform the researcher about the process of SA development.
9. Situational awareness is a necessary strategic component of multi-casualty incident management.

Limitations

Several limitations could affect the data, analysis, and subsequent results of this study. The known or suspected limitations of the study included the following:

1. The interviewees were all from one general geographic region of the southeast.
2. The limited experience of the researcher.
3. The possibility of the social desirability effect during participant interviews.

All participants were from one single southern United States region which could limit the transferability of the information to other regions. Response resources could be different in different parts of the country. Some participants were from small volunteer organizations with little funding for equipment or training. Others were from large metropolitan departments that were well funded. Theoretical sampling assured representation of the varied nature of responders in the region.

My experience in qualitative research is also limited. This was the researcher's first qualitative research project, and may have had an impact on the quality of data collection and analysis. My entering into a mentorship relationship with experienced qualitative researchers as well as securing an expert external auditor mitigated some of the effects of my inexperience.

In the case of social desirability, the concern is that, if SA development in a particular situation did not occur adequately, and subsequent decision-making resulted in less than optimal care for patients, the participant may have been less likely to report this for fear of judgment by the researcher. On the other end of the spectrum, there may have been attempts to embellish the story in an effort by the participant to cast himself/herself

in a more positive light than was actually warranted. The researcher avoided indications of approval or disapproval during interviews to lessen chances of this occurring.

Delimitations

Several points of delimitation for this study include the following:

1. The constraints placed on the sample, including experience and the requirement for minimum professional training to the level of EMT.
2. The use of MCI as the contextual unit of analysis. MCI was defined as an emergency involving between 2 and 25 victims.
3. Individual SA as the process being studied.
4. No limit on how long in the past the experience conveyed could have been.
5. No requirement for the emergency worker to currently be involved in emergency response work.

SA has been utilized in many contexts and clearly delineating the context in which it was studied was important. In this project, the process of SA development was studied within the contextual boundaries of MCI. This was done for two reasons. First, no literature was located specifically with regard to SA development in MCI and therefore studies in this area are necessary. Second, the findings could prove very useful in terms of the intended larger research trajectory of the investigator which eventually includes larger-scale events.

Summary

In light of the current global environment that includes both the possibility of terrorism and natural disasters with increasingly devastating impacts, improved outcomes driven by a new understanding of SA development, will be increasingly beneficial in emergency healthcare delivery. Catastrophes like the September 11, 2001 terrorist attacks and Hurricane Katrina showed that the need for improved SA exists. These horrible events have established the need for new ways of thinking about, assessing, and applying SA. In testimony before committees of the House of Representatives, improvement of SA in these large-scale incidents has been recommended as a national goal (Larence, 2007).

The federal government expects local responders and emergency managers to be able to mount a sufficient response to threats to public health and safety. It is only when those resources are overwhelmed and at the request of a state's governor that the federal government responds at all. Every day, many MCI occur around the country. Therefore, an understanding how SA develops at the local level is important to the management of such everyday events. An improved understanding of SA development could reduce mortality and morbidity in these instances. In addition, fundamental studies determining the development and use of SA in smaller incidents may provide a vehicle for learning more about SA development in larger events, thus eventually having a national impact.

This research project can provide the catalyst for a research trajectory including multiple studies aimed at different hierarchical levels of emergency management and the inclusion of larger mass-casualty incidents and disasters. Nursing is well suited to plan for these occurrences both large and small. In addition, I plan a research trajectory that

includes an arm that is more specifically related to nursing, such as SA and decision-making in the ED, ICU, medical surgical care areas, or other highly nursing specific settings.

Examples of SA occur in everyday circumstances, as well as extraordinary ones. For example, one may simply be aware of one's surroundings in a dark parking lot in an effort to be sufficiently cautious, or one may be an operations center manager in charge of a large-scale disaster. In either case, whether consciously or not, we continually perceive the conditions within our environment, consider their possible outcome and use that information to decide on appropriate action.

SA is utilized everyday in MCI across the country. Yet very little literature exists regarding the process of SA development in multi-casualty situations. Understanding the process of SA development may assist a broad variety of healthcare providers improve casualty care in MCIs. Additional research in the area may eventually have an impact on disaster management. This research project was necessary due to the lack of research covering this topic and because of the potential benefit to healthcare disciplines in general and nursing specifically.

CHAPTER TWO

Framing Literature

The purpose of this study is to discover a theory of SA in MCI. Grounded theory methodology was used to discover the emerging theory. There is a knowledge gap with respect to SA in MCI. Topics in this review of the literature consist of SA core concepts, contextual application, measurement techniques, healthcare application and the multi-casualty incident SA literature.

Since the primary focus of Situational Awareness (SA) is “knowing what’s going on around you”, (Endsley 2000a, p. 5) its development would be of benefit in most any situation where there are multiple data from which one must make critical decisions. Though the phenomenon of SA can be said to be at work in situations from the most mundane to those of most critical importance, it was not written about extensively until the late 1980s (Stanton, Chambers & Piggot, 2001). For this review, no limit was placed on the age of the literature. Rather, salience to the discussion and the addition to understanding of SA were compelling factors in decisions concerning inclusion of literature. In addition, technical and non-technical literature was reviewed, as they can both inform the research proposed for the comparative analysis (Corbin & Strauss, 2008). Multiple databases were searched. These databases included CINAHL, PubMed, Business Source Premier, PsychInfo, and Science Direct. Keywords searched were: situational awareness, situation awareness, situational awareness and theory, scene management, scene size-up, situational awareness and multi-casualty, situational

awareness and mass casualty, and situational awareness and disaster. While the focus of this research project was the process of SA development in multi-casualty incidents, the larger scope of mass casualty and disaster were included to allow for any overlap that may have occurred in those areas with that of multi-casualty incidents.

SA Core Concepts

Grounded theory intentionally avoids application of theory from one area, even if similar in nature, to an area where it has not been developed. The concepts and theories presented here offer a basis for discussion rather than a particular guiding model. Conceptual definitions of SA have been “highly variable” (Rousseau, Tremblay & Breton, 2004) and difficult to define as they tend to be “dependent on the situation and the context” (Patrick & James, 2004).

SA has been described as a construct, a phenomenon and a concept (Bedny & Meister, 1999; Endsley, 1995a; Smith & Hancock, 1995). It has been the subject of considerable debate. In spite of the differing opinions, some primary themes have emerged in the literature in the last 15-20 years. Endsley (1995a) provided the most widely cited model of dynamic decision-making. She described the core components of SA as consisting of three levels. They are perception (level I), comprehension (level II) and projection (level III). In addition, her model includes system/task factors and individual factors that produce effects on the development of SA and thus the decision-making process.

System/task factors include system capabilities, interface design, stress and workload, complexity and automation. Individual factors include the agent’s goals,

preconceptions/expectations, information-processing mechanisms, long term memory, automaticity, experience, training and abilities. Endsley (2000a) acknowledged that SA development is not just about acquiring information. She states that more data is not equivalent to more useful information. The information must be found, sorted processed and integrated. In Endsley's model, decision-making and the subsequent actions taken are dependent on, but separate from perception, comprehension and projection. In cyclic fashion, the development of SA leads to decisions, resulting in behaviors or actions, and those actions subsequently result in feedback, which provides new perceptions.

In light of the complexity of the concept of SA, dissenting positions exist. Two authors make the argument that Endsley's model doesn't completely capture exactly what SA is, and how it is obtained. In an article that focuses more on the impact of the environment, Smith and Hancock (1995) suggest that it is not just knowledge, but behavior toward a certain goal that generates SA. In addition, they state that the agent's perception-action cycle supports skilled performance and that the surrounding circumstances determine the knowledge needed to accomplish the goal. This view makes their concept of what SA is and how it develops, "a more ecological approach" in that it is more concerned with the agent-environment interaction (Smith & Hancock, 1995, p. 145). They suggest that SA is adaptive and externally directed. These authors reveal the importance of the adaptability of the agent to the situation. I agree that the response to conditions is critically important, however I disagree that Endsley's (1995a) model does not consider it. In fact, the perceptions obtained in Endsley's model are obtained from the

environment. However, the importance placed on the fact that the demands of the surroundings drive the adaptation of the agent is acknowledged.

Bedny and Meister (1999) offer another conceptualization of SA, utilizing the underpinnings of activity theory. They claim that Endsley's assertion of the independence of the three-level SA core model is not operationally possible. Bedny and Meister suggest that cognitive and psychic processes play a more important role than that assigned by Endsley. Endsley places these functions in the information-processing mechanisms section of her model, where they influence, but are outside of the core of SA. Bedny and Meister (1999, p. 65) suggest that Endsley's model reduces the importance of the "thinking processes" without which "there can be no meaningful and dynamic comprehension of the situation".

In an article evaluating these three views of SA development Stanton et al. (2001) suggest that each of these perspectives has an important contribution to make and that the root of the argument is whether SA is seen as a process or a product. Stanton and colleagues state that Endsley along with Bedny and Meister are referring to the product of SA development, whereas Smith and Hancock are referring to the process of development. Each of these positions is important and adds to the whole of SA.

Some authors have suggested that the interdependence of product and process requires that they be understood together and that separation is not possible. Patrick and James (2004, p. 63) make this point when they say, "attempting to separate processes from products in a rigorous manner is not feasible...any useful understanding of SA has to embrace not only a person's knowledge of a situation but also the processes

responsible for producing such knowledge, which will depend on the situation and its context.” In responding to misinterpretations of her model suggesting that she is focused more on product and discounted process, Endsley (2004, p. 322) herself states that she does not believe that “ an artificial line has been drawn stating that only one is important or that they don’t intricately affect each other.” So SA may necessarily include both product and process. However, it may be that process is simply harder to measure because of the complex cognitive and psychological processes involved. However, it has been shown that even process can be considered in multiple ways.

The ways in which process has been framed have two main foci; the cognitive processes used to develop and maintain SA and the process that an operator in a particular context goes through to achieve it. Rousseau et al. (2004, p. 5) described the difference in these two positions as being: “Operator-focused” SA, which is concerned with the “cognitive processes supporting the production of the mental representation of that information within the agent”, and “Situation-focused” SA which is concerned with “mapping of the relevant information in the situation onto a mental representation of that information within the agent.” The situation-focused type of SA is more domain-dependent. This study is clearly domain-dependent. Accurate SA development is a dynamic process that may lead to adequate SA, the product from which critical decisions are made. The obvious complexity of the topic and the breadth of its applicability require that SA be discussed among a variety of disciplines.

Contextual Application of SA

An overview of the areas in which SA has been addressed is offered in order to provide a contextual framework for uses of SA in the literature. Initially found mostly in aviation literature, SA is finding its way into many other arenas, such as commercial and military aviation, military troop operations and in business (Endsley & Bolstad, 1994; Matthews, Strater & Endsley, 2004; Miller, 2006; See & Vidulich, 1997). A large part of the research conducted and published concerning the development of SA as a phenomenon has an aeronautics focus (Endsley, 1993; Endsley & Bolstad, 1994; Endsley, 2000b; O'Hare, 1997; Proctor, Panko & Donovan, 2002; See & Vidulich, 1997). The emphasis has not been solely on SA needs in the sky, but on the ground, in terms of ground control of air traffic (Esler, 2006). The literature is also replete with examples of SA application and evaluation in military situations including those involving ground troops, armed forces aviation and team situational awareness needs specifically with respect to combat operations and training (Artman 1999; Artman, 2000; Eid et al., 2004; Matthews et al., 2004; United States Coast Guard, 2007).

In the business sector SA has been applied as a risk management tool, a way of handling corporate governance, and as means of responding to competition (Luzwick, 2000; Miller, 2006; Siemieniuch & Sinclair, 2008). SA information related to military operations also includes business functions. Industry develops SA technologies for the military, and this is reflected in news articles and product briefs (Lockheed-Martin, 2007, McHale, 2006, Raytheon awarded, 2006). In terms of budget control, the Department of Defense is equal to a Fortune 100 company and employees SA for defense acquisitions

(Myers, 2007). Various other uses for SA can be found in the literature including preparing and training police officers for the possible use of deadly force, operating motor vehicles while using a cell phone and even SA with respect to utilizing the internet (Ma & Kaber, 2005, Saus et al, 2006; You & Pekkola 2001).

Because of the technology boom, there is an increasing interest in technological support for SA development. I have been privileged to work as a student with the creators of a visual 3-D mapping tool, accentuated by many layers of information, which has been developed in my home state. This program known as Virtual Alabama, was designed to improve state wide SA for a variety of reasons to include disaster management (Norven Goddard, personal communication, January, 2007). Other examples of high technology application to SA are present in the literature including satellite navigation, telecommunications, GPS and other wireless technologies (Garshnek, Shinci & Burkle, 1998; Koudelka & Schrotter, 2006; Moss, Kaufman & Townsend, 2006; Oloufa, Ikeda & Oda, 2003). In addition, unmanned aerial and ground robotic devices have been employed in military and disaster situations (Adams, 2007; Feibush, Gagvani & Williams, 2000; Rhea, 2004). The literature addresses unmanned aerial vehicle models with application to multi-casualty scene management, and the utilization of real-time video provided to incident commanders (Rodriguez et al, 2006). Testing has been done with video cameras mounted on the helmets of hazardous materials first responders in an effort to provide real-time video inside the scene to commanders who can remain safely outside of the scene (McCurdy, Griswold & Lenert, 2005). These examples of technology

not only offer hope for future application for SA needs, but also vastly increase the amount of information that those responsible for SA must evaluate.

Grasping exactly what SA is, what technical and human factors may be at work, and how SA may be put to use, is difficult. Knowing how SA has been assessed in the past, helps provide direction for future research needs. To provide additional understanding of this complex concept, an overview of how SA has been measured follows.

Measurement of SA

An explanation of how SA has been previously measured generally, allows for further framing of research needs concerning SA, provides a means of comparison in terms of measured concepts, and provides support for the need for this study. SA has been researched, but it has not been studied in the same way, in the same context, using the methodology of this research study.

This section provides an overview of some ways that SA has been measured generally and is not intended to be a comprehensive review of the individual cognitive and psychological components of SA. The meanings of the complex concepts of cognition such as long-term memory, spatial ability, pattern-matching, attention, stress, workload (Endsley 1995, Endsley, 2000, Smith & Hancock, 1995) and so called “psychic processes” (Bedny & Meister, 1999, p. 65-66) such as reflexive functions (goals, significance, motives, behavior) are not fully explained in the SA literature, but incorporate “many existing theories in the cognitive literature” for explanations (personal communication, Mica Endsley, February 20, 2009). The purpose here is to suggest that

SA has been measured in terms of product in many ways, but much less frequently in terms of process. The fact that SA is seen as a process and a product is particularly germane to SA measurement. The purpose of this study is to develop theory that is situation-focused rather than operator-focused. Endsley states that the process of achieving SA, what she calls situational assessment, is in her view, not the same as the end product of situation awareness (2000a). This important point separates assessment and awareness or process and product.

Flach (1995) would dismiss the ability to measure SA, by suggesting that the concept itself is so elusive in terms of definition, as to make measuring it somewhat superfluous. Flach states that one cannot appreciate the end result of SA by attempting to understand isolated processing stages. The point is that the cognitive, psychic and other mental modeling necessary is simply too complex to understand, and may differ person to person. Those who see SA as a measurable product, even if occurring in a moment of time, eventually proceed to measure what they believe to represent SA.

Three types of SA measurement have been discussed in the literature. These are observer rating, subjective measures and direct measures (Pew, 2000). Each of these types has both advantages and disadvantages. In some cases batteries of tests were used, and in others, overall measures of SA were taken.

Aviation SA has commonly been studied in an effort to measure the end result of SA, that is, the operator's knowledge and the use of that knowledge to make good decisions. In a relatively early study measuring SA, Endsley (1993) utilized a combination of unstructured interviews, goal-directed task analysis and structured

questionnaires to assess SA requirements for pilots engaged in air-to-air combat. Subject matter experts (SMEs), all former pilots were interviewed to determine what might constitute good SA. Then through the review of over 175 simulated air-to-air combat missions, a goal-directed task analysis was developed. The goal tree from the analysis was then reviewed by the SMEs. From this information, a 278 item structured questionnaire was developed, with an ordinal rating of 1-3 corresponding to, not important, somewhat important, and very important for SA. Four distracter items were developed that were not found to be critical in SA. Questionnaires were sent to 30 former military pilots. Twenty surveys were returned. Findings revealed that what was previously identified by the SMEs as important in SA, generally scored high in the returned questionnaires. Many of the high-ranking items were those corresponding to Endsley's three levels of SA. While this work was encouraging, some important limitations were noted. There was no penalty for suggesting that everything was important, and scoring everything high. The study also did not take into account the temporal importance of information. Endsley described this concern as the fact that "some elements are more important at sometimes" (1993, p. 166). The implication is that some information would be more important to a pilot at some points in the mission, while other information may be more important at other times. This idea suggests that there is a temporal aspect to SA at any given time. This is an important theme.

Other studies, in keeping with the early focus on cognitive measurements as determinants of SA achievement, looked at individual abilities through a battery of tests. Endsley and Bolstad (1994), in attempting to determine individual differences in pilots,

measured pilots' spatial abilities, memory, attention, perception and cognition. Subjects were 25 former military pilots employed at Northrop at the time of the study. These scores were then compared to a well-validated and reliable test of overall SA called the Situational Awareness Global Assessment Technique (SAGAT). The SAGAT is an example of a direct measurement technique, allowing for either real-time probes or freeze probes. Evaluators can stop the simulation and administer questionnaires (freeze), or conduct them in real-time within the on-going simulation. The comparison technique used in this study allowed the authors to compare the individual batteries to an overall assessment. In addition, since the pilots were assigned to teams, an ANOVA was performed to ensure that the differences found were not related to the team to which individuals were assigned. The team that participants were on did not significantly impact each pilot's score. Battery scores were then compared to the SAGAT score. The authors concluded that spatial and perceptual skills had particular importance to adequate SA development and determined that some pilots were better at arriving at SA than others, all variables considered. A strength of this study was that the authors were able to determine which portions from the battery of tests had particular salience to SA development.

Additional studies have been aimed at recognizing the particular cognitive skills responsible for a person's ability to develop and maintain SA. Cognitive abilities may be improved by exposure. Some tests such as Work Observation Method by Activity Timing (WOMBAT) have been used in clinical settings as well as aviation (Westbrook & Ampt, 2009). O'Hare (1997) utilized computer-based, joystick panel testing using the WOMBAT Situational Awareness and Stress Tolerance Test. Individuals were tested on

pursuit tracking, pattern recognition, mental rotation, and working memory. Elite pilots, based on predetermined operational definitions, scored significantly higher on these tasks than other age and occupation matched individuals who did not meet the definition of elite pilot. This may lend support to Endsley's finding, though not fully explained, that some people are better at arriving at and maintaining SA than others. The study lacked resolution as to whether or not these elite pilots had some innate SA ability, whether their experience improved SA ability, or if both were true.

As Endsley (1995a) suggested in her model of SA, mental workload is a systems/task component, the level of which can affect SA. Several studies have attempted to ascertain the effect of mental workload in combat situations and determine whether or not it can be sufficiently modeled. See and Vidulich (1997) utilized two different subjective scales, the Subjective Workload Assessment Technique (SWAT), and the Situational Awareness Rating Techniques (SART) to determine ability to accurately computer model the mental workload and level of SA in pilots. Workload, which in turn affects SA development, was considered multi-sourced. The authors were attempting to determine that computer modeling of mental workload could be validated. Outcomes suggested that with peak workload effort, stress, understanding and SART rating were significantly correlated. SWAT ratings were not correlated with overall workload or peak workload. Therefore, understanding and SA may be reduced in the face of increased workload, even if not subjectively reported. This was an example of multiple subjective models being utilized. One of the weaknesses associated with subjective measures such as the SART and SWAT, is the potential for biased self-reporting.

In a more simplistic, yet tangible model, the operation of a motor vehicle and the effect of using a cell phone were studied in terms of their combined effect on SA (Ma & Kaber, 2005). In this study eighteen college students were recruited and randomly assigned to a group who would utilize the automatic cruise control on the simulated car and simultaneously have cell phone conversations, thereby increasing mental workload. SA was measured using the SAGAT with respect to Endsley's three primary levels of SA. As was hypothesized, under non-threatening driving conditions, the automatic cruise control reduced workload and improved SA. The use of the cell phone was negatively associated with SA. Further testing concerning mental workload has been accomplished using both subjective mental workload assessments and physiologic measures such as heart rate and videotaped eye movements. These measures can reveal physiologic response, and patterns of perception and understanding respectively (Svensson, Angelborg-Thanderz, Sjoberg, & Olsson, 1997).

SA is affected not only by the human factors involved, but also by the technological interfaces employed by humans. As we move further into the age of information and technology, research in this area advances. Sarter and Woods (1991) suggest that there is insufficient research to suggest that increased automation is somehow better for developing SA.

A study attempting to determine the effects of automation on air traffic control functions found that automation was helpful in terms of the lower level functioning of information acquisition and action implementation. However, automation increased workload with respect to information analysis and decision-making (Kaber, Perry, Segall,

McClernon & Prinzl, III, 2006). In this case, more information did not necessarily result in better outcomes. This study seemed particularly significant because automation is increasingly applied in our world today. Understanding its effects on SA development and use provide beneficial information.

Included in these technological advances, are advances in SA measurement. In a pair of papers, two authors looked at what is termed judgment analysis (Kirluk & Strauss, 2006; Strauss & Kirluk, 2006;). Advanced methods for experimenting with and statistically analyzing the use of information for SA involving work environments and technological interfaces, decision-making and in this case, judgment are offered. Improved analysis may result in improved measurement, and thus better results. These companion articles are heavily engineering geared, but offer new ways of considering the breakdown of SA into measurable pieces.

Salmon, Stanton, Walker, and Green (2006) have used the term C4i to signify large systems which may be in need of SA, such as the military, emergency services, police and other large infrastructures. C4i stands for command, control, communication, computers and intelligence and indicates the main components in providing for SA in these large operations. This type of large-scale SA provides a tremendous challenge to professionals known as human factors scientists. These researchers are typically ergonomists and industrial engineers. More research in these areas will be helpful as to what constitutes adequate SA for an individual pilot. However, this SA may not be the same as that needed for a large manufacturing plant with heavy automation. Often these

types of organizations require the assessment of SA on many fronts simultaneously and with teams of people involved.

The measurement of team SA, a distinct version of SA that is highly utilized in military and other large-scale operations, has been studied. In an example of an observer rating method of evaluation, five shift teams from a nuclear control room were provided with three different scenarios (Patrick, James, Ahmed & Halliday, 2006). Results were videotaped and scored using a rating scale. Social interaction with team leader coordination, planning, problem solving and contingency planning were all found to be important factors in team SA. Communications was also found to affect the level of SA development, with higher levels of effective communications resulting in higher scores. Importance of verbal communication in team SA was also emphasized in a study by Lampton et al (2005, p. 9) when they stated, “Some of the best data for assessing SA, decision-making, and leadership in team settings are also the least used”. These studies indicate the need for additional research concerning verbal team interactions in SA.

Measurement of SA after training can also improve cost effectiveness. Proctor et al. (2002) discussed the cost effectiveness of team SA training in helicopter pilots through the use of off the shelf PC gamers. The research involved two sets of helicopter pilot volunteers, eight in Georgia, and twelve in Kentucky. A pre and post-test was administered reflecting the needed knowledge for mission success for the team. After training with a simple off the shelf device, results revealed a statistically significant improvement for posttest assessment outcomes. In addition, there appeared to be individual as well as team learning even though the training only involved team training.

A study weakness was the small cohort and the lack of diversity with respect to geographic location. However, this study revealed a novel and cost effective way to improve SA in teams.

Observer rating, subjective assessment, direct measurement, or a combination of these methods has typically measured SA. Each method has distinct strengths and weaknesses. Subjective measures are inexpensive and easy to use, but have the limitation of potentially biased self-report (Endsley, 1995b). Observer ratings are field friendly and non-intrusive other than the possible impact of the observer (Salmon et al., 2006). Global direct measures, those that measure overall understanding of a situation with specific questions, are advantageous in that they directly measure SA and thus avoid the difficulties of subjectivity and collection issues, but lack sensitivity to individual factors because of the global nature of the measurement (Endsley, 1995a; Salmon et al., 2006). This measurement section serves as a basic description of ways in which SA has been viewed in terms of measurable factors. An explanation of healthcare delivery uses of SA is provided next in order to further frame the current study, and provide support for its need.

Healthcare Application of SA

Some literature was located that not only had a healthcare focus but was also directly related to the intention of SA. While the words “situational awareness” were not necessarily in the title, terms were found in the introduction or abstract, or were clearly related to public health surveillance and therefore were included in this review.

The particular use of SA with respect to direct healthcare application tended to be associated with the size and complexity of the organization utilizing it. Articles were written from the perspective of either large-scale application and surveillance (Bradley, Rolka, Walker & Loonsk, 2005; DeFraites & Chambers, 2007; Reis et al, 2007), or from a smaller, more focused, unit-specific perspective (Bond & Cooper, 2006; Gaba, Howard & Small, 1995; Levine, Meyer, Brzezinski, Robbins & Sanberg, 2005). The literature in this area was virtually all descriptive or literature review in nature.

Two articles were located regarding overall surveillance with respect to SA. One study discussed a program introduced by the Centers for Disease Control and Prevention (CDC) concerning national biosurveillance, called Biosense (Bradley et al., 2005). A description was provided including its purpose which was the collection of real-time data from government treatment centers such as Veterans Administration (VA) hospitals and from one of the major laboratory services providers, Labcorp. When syndrome-type conditions are reported in clusters, or requests for lab tests suggest a concentration of these conditions, Biosense is able to analyze and integrate that data. The information is collected at a Biointelligence Center at the Centers for Disease Control and Prevention (CDC). This information is obviously very helpful for national SA with respect to Biosurveillance.

Massachusetts has implemented a similar state level program. It is called the Automated Epidemiological Geotemporal Integrated Surveillance (AEGIS) system (Reis et al., 2007). This initiative is similar to Biosense, but receives reports only from “participating” facilities (Reis et al, 2007, p. 281). As with Biosense, AGEIS will be

helpful with respect to state-level SA in terms of biosurveillance, but is limited to those facilities that choose to be involved.

The Department of Defense (DOD) performed an exercise concerning avian flu pandemic outbreak using standard military architecture, their current level of capability, and a management system designed for users within the community (DeFraites & Chambers, 2007). The platform provided geographical information, medical information such as, unit readiness, personnel and bed status, critical supplies information along with epidemiological information, patient tracking and environmental conditions. The scenario concerned an outbreak of avian flu in Thailand and those displaced in Thailand, the United States, and Singapore. This exercise is an example of application to a very large-scale SA need. It is limited to military infrastructure and limited in scope in terms of the event. The most helpful aspect of the study was the fact that avian flu is a (potentially) highly propagatable situation, increasing the scope of the needed awareness.

Literature also provided three examples of SA requirements applicable to healthcare that were very situation and setting specific. Gaba et al. (1995) applied the concept of SA to the practice of anesthesiology. Anesthesiology is a high risk healthcare service and requires physicians, nurses and other healthcare providers to have a shared awareness of patients under their care. These authors applied the principles of an anesthesiology decision-making model to provide overall SA in a particular medical situation. This article provided support for application to healthcare settings. Gaba and colleagues applied SA knowledge to several case situations and made further recommendations concerning how SA could be applied more readily to anesthesiology

through case review, real-time observation, and simulation and briefing techniques among physicians and nurses.

Levine et al. (2005) made the case that team situational awareness in the operating room could be improved through the use of complete data capture, integrated data displayed and augmented team vigilance and decision-making. A large screen displaying data in a room would allow viewing of the data from particular vantage points that would not be possible with current surgical draping procedures. Though primarily concerning decision-making models, Bond and Cooper (2006) determined that critical healthcare decision-making, including decisions by nursing staff was affected by the level of SA.

Brooks and Thomas (1997) used content analysis to advance King's Interacting Systems Framework by beginning the explication of their own theory called Brooks' Theory of Intrapersonal Perceptual Awareness. In this work, the authors showed that perception and judgment interact in a way that affects decision-making in nursing care. This study provides additional insight of how the phenomenon of SA may impact nursing care. One major notable difference between Brooks and Thomas' study and this one, is the experience level of those being studied. While these authors were studying senior baccalaureate nursing students, who have little experience, this project studied experienced healthcare responders.

Contrast of large-scale SA needs and the more limited scope of situation specific articles allowed a view of SA from two extremes, thus providing additional understanding of the breadth of the potential information, systems requirements, technology and personnel potentially involved in SA development. This provided a

broader understanding of the meaning of SA, which was particularly helpful in an exploratory study such as the one conducted.

Multi-Casualty Incidents and Scene-Specific SA

Multi-casualty scene SA development was chosen as the area of focus because it was important in its own right and also is the most fundamental aspect of the application of SA to disaster preparedness that is a part of my research trajectory. Understanding how SA develops initially is critical not only to an eventual understanding of larger scale events, but also to an appreciation of the difference between field-level and upper-level managers' SA needs. Only one article was found in which the combination of situational awareness and either multi-casualty or mass casualty appeared in the title (Demchak et al., 2006). However, terms that are keyed in alone like mass casualty, multi-casualty, casualty, triage, scene management, scene size-up and disaster are salient to this topic. Therefore using those keywords additionally in the search engines for this section of the review allowed for the location of many articles, some of which were particularly helpful. However, the fact that an emerging concept like SA and the terms mass or multi-casualty, did not appear in literature titles together indicated the need for further research in this area.

Multi-casualty or mass casualty scene management with regard to SA is sparsely found in the literature but there are articles that incorporate portions of what an understanding of SA from the field may require. Therefore issues related to field level SA in multi-casualty incidents may have salience to the larger concept of SA.

Many concepts that are possible pieces of the field-level SA picture are located in literature. These include triage and communications (Johnson & Calkins, 1999), and patient distribution (Zoraster et al., 2007). Zoraster and colleagues determined that victims from a mass casualty incident were sent to different hospitals in basically equivalent numbers regardless of their acuity, indicating the lack of matching hospital capability to patient condition. Johnson and Calkins (1999) mention that multiple communicators from the scene, and lack of clarity in terms of patient numbers and types led to only 38% accuracy in pre-hospital triage information. This article raises the concern that what and how information in the field is developed can be problematic. The authors were physicians who did not work in the field and may not understand some of the implications for the measures they used. For example, multiple communicators meant that more than one person from the scene was providing information. As higher-level commanders arrive at a multi-casualty scene, they may take over communications, which may be a completely acceptable practice, yet result in confusion on the part of those receiving communications from the field. The incidents that were reviewed were termed “small mass casualty incidents (MCIs)”, meaning that they were mass casualty incidents involving 3-50 people. It may not be reasonable to term an incident involving three people “mass” casualty, even with the “small” qualifier.

Another part of the SA puzzle especially with regard to high casualty numbers, is patient tracking. Alm, Gao and White (2006), researchers at Johns Hopkins University, have developed a GPS aided electronic triage tag that will track the patient after triage,

even if he or she leaves the scene on their own. This could be helpful in tracking patient information as a part of SA.

Some studies referring to field-level incidents use the word “scene” to signify the area involved in the incident indicating location of patients, damage as a result of the incident, treatment and adjacent areas such as landing zones and staging areas (Augustine, 2006, Cotter, 2006, Limmer et al., 2006). Much data may be taken in or acquired concerning the scene including visual and auditory cues, communication, victim and worker safety, triage, treatment and personnel consideration. While victim safety and care is a top priority, worker safety is also important. Limmer et al. (2006) reported that more public health providers die in the line of duty related to heart attack and traffic accidents than violence. However, these authors also reported an exception in 2001, when the World Trade Centers were attacked and many emergency responders perished in that one incident.

In a particularly pertinent article, Augustine (2006, p. 1) discusses “organization” of the scene. In this example, organizing represents what has been referred to as the process, while organization represents the product of situational awareness. The findings addressed in this section lend support to the need to develop SA as a process.

Even dispatchers require good SA to do their jobs. Blandford and Wong (2004), extended scene SA to include the assistance that dispatchers can provide due to being free to focus their attention on what is happening on the scene, without being directly involved in the scene operations. They suggest that there is a mental model that consists

of static information that does not change but is applied to a changing dynamic environment.

The literature concerning multi-casualty incidents has been non-specific defining field-level multi-casualty incidents and how SA is developed. Studies conducted have dealt with parts of SA. However, they have failed thus far to determine the integrated process for SA.

Summary

This literature review serves to frame the knowledge that was used to approach the problem of how SA develops in multi-casualty situations. Because of this study's methodology, it was not intended to lead to prescribed hypotheses, but to inform the research. Conceptual and theoretical traditions with regard to SA, the contexts in which it has been employed in the literature and a review of how the complex phenomenon of SA has been measured in the past, have been discussed. Examples of SA literature that is healthcare specific and information concerning the literature gap with regard to SA and multi-casualty incidents were offered.

I believe that Auf der Heide (2006, p. 34) said it best when he stated, "Knowledge based on systematically collected data from field disaster research studies might help planners avoid common disaster management pitfalls, thereby improving disaster response planning." The methodology chosen for this study is that of grounded theory. Endsley (1995a, p. 60) one of the most prolific writers concerning SA, although she appears to be nearly an exclusively quantitative researcher, suggested that, "Research is

also needed to better understand the processes operators use to achieve SA.” Her own comments suggest that grounded theory may be helpful in determining how SA develops.

CHAPTER THREE

Methodology

Much more is known about SA as a product than as a process, mostly because the product is more readily measured. The product of SA can be considered a particular amount and/or type of information being known to the operator at a given point in time. On the other hand, the process utilized for developing SA is thought to be primarily cognitive. This is what Bedny & Meister (1999, p. 65) termed the “thinking processes” of SA. The product of SA has been tested using self-report, observational and direct measures mostly in aviation models (Jones, 2000). The process on the other hand seems to have undergone little measurement. Neither the product nor the process is sufficiently covered in the literature with regard to the domain of multi-casualty incidents. Therefore, the lack of knowledge in this domain with regard to emergency preparedness is notable and guided the need for this study. The purpose of this study was to discover and explicate substantive theory concerning the process individual emergency responders use to develop and maintain SA in field-level MCI.

The choice of grounded theory methodology for this research project was driven by many factors. Among them were the requirements for obtaining the evidence sought, what is and is not known about the phenomenon, the philosophical foundations of the method, and the moral and professional responsibility to perform the research. Consistent with grounded theory methodology are the inclusion criteria for participants, along with methods for recruiting participants, the methods for obtaining and analyzing data, and

maintenance of rigor. I will cover each of these aspects of this research project in this chapter.

Not only is a theory of SA in MCI needed, but also because SA, the process, is fundamental to SA the product, the methodology of grounded theory was selected. Grounded theory is a good fit for determining process (Charmaz, 2006). Grounded theory means that the findings of the study are “grounded” in the data collected. In this case, data include interviews of participants, field notes and memos. Grounded theory is both rigorous research and because of theoretical sensitivity, “fluid”, “dynamic”, “flexible and driven by insight gained through interaction with the data” (Corbin & Straus, 2008, p.12).

The Corbin and Strauss (2008) method was utilized, with additional perspective on the process of grounded theory offered by Charmaz (2006). These two approaches are different but complementary. In Corbin and Strauss’ (2008, p. 9) book, *The Basics of Qualitative Research*, Corbin comments on her appreciation of how Charmaz has, “applied postmodernist and postconstructivist paradigms to grounded theory methodology.” Charmaz brought a unique focus to grounded theory by conceptualizing it in terms of modern thinking (Juliet Corbin, personal communication, April 1, 2008). This is additionally important in that the latest book by Corbin & Strauss (2008) is less focused on the idea that qualitative research must end in theory, although they continue to suggest that it certainly may.

Charmaz (2006) offers additional perspective which was of benefit to me. For example, Charmaz (2006, p. 57) suggested the intermediate step of “focused” coding, which assisted with managing the most “significant or frequent earlier codes, to sift

through large amounts of data.” The additional step of focused coding not employed by Corbin and Strauss, helped bridge the gap between “breaking data apart” (Corbin & Strauss, 2008, p. 195) and the need to “put it back together again by relating those concepts.” (Corbin & Strauss, 2008, p. 198)

Theoretical Sensitivity

A critical aspect of qualitative research is the ability of the researcher to add insight to the study through his/her own unique view. It is the sensitivity of the researcher to subtle cues in the data that create what Strauss and Corbin (1990, p. 41) referred to as “theoretical sensitivity”. The researcher illuminates the data and explicates the meaning found therein by becoming an instrument in the analytic process. My involvement in many types of healthcare delivery environments, including providing care after MCIs, provided the basis for my theoretical sensitivity.

Theoretical sensitivity may be found in such sources as literature and life experiences, both personal and professional. Literary and experiential exposures provide background and a frame of reference from which to view the data. However, it is equally important that the researcher avoid imposing his/her own view of experiences on the data. Bracketing is one way to avoid this situation. The balance necessary for accurate assessment of the data is also maintained by interacting with the data, maintaining healthy skepticism and considering categories, hypotheses and questions provisional until they are truly “played against the actual data” (Strauss & Corbin, 1990, p. 45).

I became interested in SA development in a way that has coupled my professional experiences with my doctoral studies. My first experiences in the healthcare field were as

an emergency medical technician (EMT), and later a paramedic in emergency medical services (EMS). As I worked daily, I cared for many people in various circumstances, many times working on multi-casualty scenes involving car accidents, assaults, shootings, stabbings, and the plethora of typical medical calls that EMS personnel encounter such as the exacerbations of heart and respiratory conditions, diabetes, seizures and many other medical situations. Having an appreciation of the clinical aspects of patient care was certainly necessary, but insufficient alone. More information was needed. I was occasionally in the unpleasant position of being in some degree of danger myself due to car fires, flying debris from extrication procedures and even the occasional threat to my safety from the intentional act of some other person. Patients themselves may be in danger even after rescuers have arrived, due to fires, equipment utilized for extrication, threats from those with whom they may have been involved in a previous confrontation, and for many other reasons. Although I did not always acknowledge it as such, this contextual awareness is what has been referred to by Endsley (2000a, p. 5) as “knowing what is going on around you”.

I learned about such concepts such as triage, patient disposition, scene safety and others. Even though I had over seven years experience in EMS service to apply those concepts and hone my skills, I never really considered them to be one continuous information-processing technique. Rather, I saw them as many small assessments and decisions that happened to be linked together. When, for example, we declared a scene safe and began caring for those on the scene, I knew that at any moment the scene could become unstable. However, my attention was no longer focused on initial scene

assessment, because that had been accomplished. My attention was focused on the next bit of information processing necessary in order to care for those in need. In the years I spent in EMS, I never recalled hearing the term “situational awareness” used. We were simply making a series of decisions necessary to control an out of control situation in the lives of a person or persons. These experiences informed my research.

Later, I continued in healthcare as a nurse working in intensive care units (ICU), and the emergency department (ED). The circumstances in these settings differed from the EMS setting in many ways. It was certainly a more controlled environment. However, the intensity of information processing and the use of multiple pieces of data to make decisions that were critical to health remained. Situations that must be handled properly and are critical, require the rapid retrieval, review and processing of information to be used for decision-making. Working as a nurse simply forced my information-processing concerns to change with the situation, but did not allow them to be disregarded. Yet, it was not until I was a hospital nursing educator that I heard the term nursing would seemingly embrace for taking accurate information and making good decisions in nursing--critical thinking. Critical thinking carried with it a very clinically focused connotation. But many factors contribute to the environment in which patient care is delivered. These factors then contribute to over-all SA.

As a nurse educator at a healthcare facility and as a faculty member at a university, I found that the educational needs of nurses varied. Some were new nurses and required orientation to the hospital and unit to which they were assigned, fire safety, and other basic education and training. In other cases nurses needed advanced training

such as: Advanced Cardiac Life Support (ACLS); Pediatric Advanced Life Support (PALS); monitoring of critical equipment such as pulmonary artery catheters, intra-aortic balloon pumps; twelve-lead electrocardiogram interpretation; and other function-specific education and training. Therefore, assessing which nurses needed what type of training to operate safely was another example of understanding the information needed in a given set of circumstances.

Finally, during my doctoral studies at the University of Tennessee, Knoxville, in the Homeland Security Nursing program, I was privileged to have been provided the opportunity to work on a unique program designed specifically to improve SA on a state level. A cooperative program between the Alabama Department of Homeland Security and the United States Space and Rocket Center was developed to be used by emergency managers on a statewide basis for all types of information gathering and decision-making. This unique and the first of its kind in the country initiative is called Virtual Alabama, or Virtu-Al. It's most obvious use, though certainly not program limiting, is improved coordination among jurisdictions in an emergency event. The program is based on a purchased Google Earth platform, onto which higher resolution imagery is stitched. This improves resolution of images dramatically.

Other important information has subsequently been layered into the program including flood plains, video of the inside of critical infrastructure, connectivity with real-time traffic cameras, 3-D sketch-ups for virtual building tours and many others. I have spent many hours learning about the system, assisting with implementation and even being present during presentations to Alabama state departments and officials of other

states who are interested in possible implementation in their own jurisdiction. I assisted with the presentation of the program to a particular emergency preparedness group. I continue to be involved in the Virtual Alabama program and it has been a catalyst to my appreciating the need for improved SA in many situations and on many different hierarchical levels. The opportunity to work on this initiative provided to me in the Homeland Security Nursing program, along with my specific healthcare background and interests were germane in my decision to conduct this study.

I have completed a fundamental course in qualitative methods that included a grounded theory project. I have met with the grounded theory group on the University of Tennessee campus, and met personally with the grounded theory specialist at the university. The specialist agreed to mentor my research project, and I took actual research transcripts for analysis to the grounded theory group that meets at the University of Tennessee, Knoxville, College of Nursing. In addition, one of the foremost grounded theory experts in the nation, Juliet Corbin, reviewed some of my data to offer insight, direction, and help improve my skill as a researcher. These experiences have shaped my interest in SA, provided me with a high level of theoretical sensitivity for the domain and the subject in this study, and improved my skill as a researcher.

The Philosophical Underpinnings

Philosophically, grounded theory is driven by pragmatism and symbolic interactionism. The writings of John Dewey and George Meade concerning philosophical pragmatism have heavily influenced the epistemology of grounded theory (Corbin & Strauss, 2008). Grounded theory is also based on symbolic interactionism, because the

meaning that something has for a particular person impacts their view of and interaction with it (Blumer, 1969). Naturalistic inquiry is beneficial in attempting to determine a particular process that occurs in naturally occurring human experience (Zsombok & Klein, 2007). Each of these concepts will be discussed in this section as they pertain to grounded theory methodology.

Pragmatism

Pragmatism states that knowledge and practice are both critical for the advancement of science. This philosophical viewpoint does not recognize practice-based knowledge over contemplative, but the need for both in solving practical problems. An excellent representation of this point is found in a footnote quote from John Dewey's *The Quest for Certainty* (1929), where he states:

In reaction against the age-long depreciation of practice in behalf of contemplative knowledge, there is a temptation simply to turn things upside down. But the essence of pragmatic instrumentalism is to conceive of both knowledge and practice as a means of making goods—excellencies of all kinds—secure in experienced existence.

Dewey (1929, p. 106) suggests that there are problems with accepting “knowledge” (experimental science) as being “superior to practical activity.” Dewey’s point was not that practice is superior to knowledge, but that both are necessary. Charmaz (2006, pp. 6-7) commenting on the development of the original grounded theorists

Barney Glaser and Anselm Strauss, claims that it was the marriage of Glaser's "Columbia University positivism" which was grounded in empiricism, with Strauss' "Pragmatism informed symbolic interactionism" that led to what grounded theory was in its initial development.

Practice as an activity can lead to discovery. As Corbin & Strauss (2008, pp. 2-3) said, "Typically the activity is precipitated by a problematic situation." Therefore, philosophical pragmatism supports the selection of research design that is most well suited, and therefore "pragmatic" under the particular circumstances being studied. The conclusion is made that pragmatism supports the idea that knowledge based on the experimental model is important for informing practice, but equally, that evidence found in daily practice informs and constitutes research as well.

Symbolic Interactionism

Symbolic Interactionism supports and combines with pragmatism to further inform grounded theory and claims that human beings act toward things on the basis of the meaning it holds for them (Blumer, 1969). Further, the meanings that things have for human beings are "derived from" and "modified through an interpretive process with the objects or ideals they encounter" (Blumer, 1969, p. 2). Meanings may be acted on in many ways, but without context, meaning is meaningless. Corbin and Strauss (2008), state that to avoid a cycle of absolute relativism, one must accept the assumption that knowledge gained is temporal, applicable to a given point in time, and may not hold true in the future. Therefore, by studying action and interaction in daily contextual meanings,

one can increase the epistemology of a particular field or discipline for some unspecified period of time.

Where human interaction takes place as part of the research, then context, and thus interaction, matters. Since that is the case in this study, the problem was viewed through a lens of interactionism. When contextually-based human-to-human interaction is being studied, interactionism carries a necessary set of assumptions and is especially critical in highly charged environments, where meaning has ultimate importance.

Naturalistic Inquiry

Since one of the basic premises of this project is that context matters, naturalistic inquiry was appropriate for the study. Naturalistic inquiry dictates that the data is collected in or at least concerns the natural setting in which the happenings occurred. Much work done concerning decisions made in highly stressful environments, has utilized cognitive task analysis. (Crandall, Klein & Hoffman, 2006; Zsombok & Klein, 1997). Klein (1998) developed the recognition-primed decision-making (RPD) model which he used for high stakes decisions made by experienced providers in uncertain conditions. However, a difference between this study and Klein's work is that the effort here concentrated on the information development phase, rather than the resulting decisions. Naturalistic inquiry informed this project because data was collected concerning actual high stakes events.

For this study, the focus was process. Therefore, grounded theory was a good fit. Process involves and represents action, interaction, and emotion in a given set of circumstances. It also involves "individual's, organization's, and group's ability to give

meaning to and respond to problems and/or shape the situations” that are being studied (Corbin & Strauss, 2008, p. 98). Processes and sub-processes were reviewed, categories established and theoretical integration undertaken. Theoretical integration provided an overall unifying explanatory theme that constituted the eventual substantive theory. Theory development concerning the process by which individuals develop and maintain SA was the focus of the study.

In summary, grounded theory was pragmatically applied to the highly contextually-based problem of developing SA in MCI. The process required human-to-human interaction, used derived meanings and had the potential for dire outcome. SA was used by responders to work toward a successful resolution to a significant problem. Grounded theory as an inductive methodology, offered the best means of understanding the process. While each participant’s SA experience is unique, there was sufficient collective commonality of experience to identify the process.

Moral and Professional Responsibility

Nurses and other healthcare providers have a moral responsibility to carry out research that will benefit public health. In an age of devastating natural disasters such as Hurricane Katrina and terrorist attacks such as that carried out on September 11, 2001 at the World Trade Centers, research improving planning and response efforts is no longer in the margins. It is a timely and necessary area of inquiry and there is a moral responsibility for those who are qualified, to act to improve response efforts. Although there have been claims that the devastating incidents previously mentioned could not have been foreseen, so planning for them was impossible, we now know that these

incidents probably will occur again on the United States mainland and around the world. Therefore, planning and response efforts must be improved and will require solid research upon which to build.

Nursing has a tradition of meeting the healthcare needs of society and nurses are in a unique position to impact many areas of healthcare. Emergency preparedness is one such arena. While many non-nurses constituted a major portion of the participants in this study, the fact that nurses are the largest single healthcare provider in terms of numbers, makes it critical that emergency preparedness clinical response as well as management and planning be placed clearly within the purview of nursing.

Definition of Multi-Casualty Incidents

Many different situations, such as motor vehicle accidents, shootings, assaults, chemical exposures, fires and others can cause multiple individuals to become victims. This type of incident may be termed a multi-casualty incident (MCI) because multiple people can be harmed at once as a result of one incident, or several close time-related incidents. The development of SA in multi-casualty incidents is very important in its own right. A full appreciation of how SA develops in this setting could improve multi-casualty incident response for many daily occurrences. Because multi-casualty incidents are in a sense the micro version of a community disaster an understanding of multi-casualty incident SA may in some way inform future research involving larger scale incidents.

Many organizations discuss the need for preparedness with regard to multi-casualty incidents. The problem is getting a clear definition of what it is. Further compounding the confusion is the use of the term, mass casualty incident in place of, or

interchangeably with, multi-casualty incidents. Some writers use the acronym MCI, which is the acronym for both multi-casualty incidents and mass-casualty incidents. Unless the writer is very clear, the reader may be unsure of which terminology is being used, and the intent of its use. For example, the CDC has a web page that discusses mass casualty incidents but does not provide a definition of the term (Mass Casualty Event Preparedness and Response, 2008). The writers of the book entitled, *Advanced Disaster Life Support*, use the acronym “MCI” on page 2 of chapter 1, without ever having even defined the acronym (American Medical Association, 2004, pp. 1-2). It is not clear whether they mean mass, or multi-casualty and how many victims are being inferred.

The word “mass” intuitively seems to indicate a higher number of anything than the word “multi”, a fraction of the word, multiple. On a web site designed to assist with triage of multiple victims called JumpSTART (Simplified START/Jumpstart algorithms, 2008), there is a page that defines mass-casualty incidents as having multiple levels depending on the number of victims. These levels follow: Level 1 = 5-10 victims, Level 2 = 11-20 victims, Level 3 = 21-100 victims, Level 4 = 101-1000 victims, Level 5 = over 1000 victims. An article by Johnson and Calkins (1999, p. 148), calls an incident with between 3 and 50 victims a “small mass-casualty incident.” It is clear that there is not agreement on what constitutes a mass-casualty, or multi-casualty incident.

Neither of these definitions sufficed for my purposes. The range of potential experiences with regard to these numbers was too broad. For example, using the Johnson and Calkins (1999) definition indicates that 3 victims, or up to 50 victims, constitutes a similar experience. While these numbers are admittedly pragmatic in terms of simple

definitions, they were not sufficient to provide any consistency for the purposes of research. Three is not a mass event, and neither is 50 a small event, yet both fit into Johnson and Calkins definition of small mass-casualty.

Clarity is critical concerning my use of the term “multi-casualty incident”. The definition needed to offer enough flexibility to provide for theoretical sampling, and yet enough delimitation to avoid a large degree of ambiguity. Therefore, for the purposes of this research study, the following definition applied:

A multi-casualty incident (MCI) will consist of an incident occurring outside of a medical facility that produces physical injury to between 2 and 25 people.

This definition was not designed to discount the psychological injury that may occur in an MCI, but to suggest that it may be more difficult to quantify, and therefore was beyond the scope of this definition. It is also noted that if one has sustained physical injury, one may also have sustained psychological injury, and they are not viewed as mutually exclusive. These two types of “injuries” may co-exist.

Conceptual Definition of SA in MCI

Following the review of the literature and after considering the view of SA from the perspective of a healthcare provider, a conceptual definition was developed to provide a basic understanding of SA in MCI prior to conducting the study. It was expected that the definition would be refined based on the study findings. The definition is as follows:

SA is the ability to accurately identify, perceive and comprehend the multi-source, relevant information pertaining to a particular emergency event or series of events, thereby producing the ability to mitigate current conditions and/or project future impact sufficient to facilitate effective action in planning for or responding to, public health and safety needs.

Participant Inclusion Criteria

Participant inclusion criteria for this study were:

1. Healthcare workers trained to at least the emergency medical technician (EMT) level at the time of the incident that they chose to convey.
2. Those who have responded to an MCI in the field.
3. Those with at least one year of experience.
4. English speaking and at least 18 years of age.
5. Those willing to discuss an MCI to which they responded.

The participants for this project were drawn from the community of healthcare providers who have responded to multi-casualty incidents in the field. The participant pool included responders to multi-casualty scenes, who were trained to at least the basic Emergency Medical Technician (EMT) level. Included in the study were firefighters who were cross-trained medical providers, EMTs, paramedics who were trained to beyond the EMT level, nurses, and a physician who responded to field-level scenes. They were all from the southeast region of the United States.

There was no requirement with regard to the time that elapsed since the occurrence of the emergency response that the participant chose to convey. Flashbulb

memory research suggests that important and powerful memories are typically recalled well by those who find an event in some way distinctive (Edery-Halpern & Nachson, 2004). While Marsh (2007) suggests that the retelling of a story may be impacted by the social context in which occurred, grounded theorists accept this and acknowledge that participants “construct meanings and actions in specific situations” and therefore study “how” and “why” this occurs (Charmaz, 2006, p. 130). It was felt that limiting what participants may discuss, could have the effect of mitigating the richness of the findings and was therefore avoided.

If the response the participant conveyed occurred many years before the interview, technologies may have changed in some fundamental ways and these were pursued with the participant for clarity. However, it was felt that the overall situation-focused theory was not affected in ways that would lessen the usefulness of the theory for current responders.

Participants were not required to be currently active in emergency response work. However, only one participant was no longer an emergency responder. In this case, the responder’s departure from field-level healthcare delivery had occurred just months before the interview for this study.

Those who have less than one year of experience would provide additional variation in terms of their approach to SA development. However, I chose to exclude them to avoid their complete lack of response experience. In highly charged environments, circumstances may simply overwhelm the novice provider, who may in

any event be in an assistive or probationary role, and may be less exposed to the inner-workings of the scene.

Literature is available that address not only highly stressful conditions of field-level providers (Federico, 1995; Klein, 1998; Klein, 1993), but that also discusses how experienced nurses might make decisions and utilize intuition in doing so (Benner, 2001; Crandall & Getchell-Reiter, 1993). While these authors' writings are extremely informative, and have value for this study, they focus on the decision-making process rather than the information development and processing that is the focus of this theory development study and so were of very limited value in determining what experiential level of provider should be included. There was no upper limit placed on experience. Theoretical sampling for experiential level and professional discipline was carried out.

Theoretical sampling was used to provide variation in the participant pool, to avoid premature closure of the process and insure saturation of categories. Variation theoretically sampled for included; experience level in years, context of the incident conveyed, the professional discipline of the provider and whether providers were volunteer or paid personnel. Theoretical sampling for professional discipline was particularly important in this study because nurses are a minority in terms of emergency response, and having their view represented in the data, while avoiding over-representation, was critical to me as a nurse. Theoretical sampling in these ways, provided means "to identify those variables that make the difference in finding as much variation as possible" (personal communication, Juliet Corbin, June 8, 2009).

To avoid blunting the full saturation of any uncovered concepts, it was not only the experience of the seasoned, well-equipped provider that was sought, but also those with less training and equipment. Many responding personnel were from agencies with varying resources. Some were from volunteer agencies where no remuneration was provided for the services rendered. I felt it was critical to capture these variations within the sample. The allowable experiential level ranged from a well-compensated and trained paramedic responder with thirty or more years of experience to that of a volunteer EMT with one year on the job, to a nurse responding as part of a flight crew. The sample of participants allowed for sufficient variation providing rich data with fully saturated categories.

The experiences analyzed were those occurring outside of a healthcare facility. This response requirement was intended to capture the nature of emergency response that typically occurs where there are not trained personnel ready to handle the situation. This permitted looking inside the process of grasping a situation totally out of control and bringing it under control.

Participants were asked to convey the story of a particular emergency response effort to which they responded. The memories and experiences shared by the participants may have reflected conceptual discussions or even actual references to other events. While general references to other events that may have shaped their frame of reference of SA were permitted, attempts were made to prevent participants from blatantly discussing incidents of scale larger or smaller than the MCI criteria required in this study. To prevent contamination of the data, responders were informed in the preliminary stages of

recruitment about the research criteria, were redirected during the interview if clear reference to incidents of scale other than that which met criteria were discussed and the extraneous information was isolated in the transcript and excluded from analysis.

Participant Enrollment

Fifteen participants were recruited through the process of word of mouth communication, flyers placed in regional EMS stations, fire stations, flight crew headquarters and through personal contacts by the researcher (see Appendix A). The researcher's contact information was provided on the flyer so that those interested could contact the researcher. Potential participants were spoken to by phone, in person or by email and were provided a verbal explanation concerning the purpose of the study and their involvement. In the event that the person was interested in learning more or participating in the study, a personal meeting was arranged. At this meeting, having received a complete explanation of the implications of their participation, potential participants were free to choose whether or not to participate. They were also advised that they were free to change their mind about their decision regarding participation at any time. Initial contacts resulted in some snowballing in participation. I also received oral and written support for the research study from emergency response supervisors in the area and I attend the local emergency planning committee meetings, which provided additional opportunities for making contacts and obtaining participants.

Data Collection and Analysis

Data Collection

One pilot interview was conducted for the purposes of trialing the semi-structured questions, providing researcher experience and identifying other possible interview questions. Following the interview, field notes were written and the transcript was coded. The Institutional Review Board at the University of Tennessee approved the study (Appendix B). Data collection continued from September 2008 through January 2009. Data analysis occurred during data collection and continued after collection was complete, until theory development was complete.

In grounded theory, concept saturation determines sample size. It was anticipated that as few as 12 and as many as 30 participants would be required. Saturation of concepts was achieved at 15 total participants. Data were managed using the qualitative software program NVivo 8 ®.

Face to face digitally recorded interviews which ranged from just under 30 minutes to over an hour, constituted the bulk of the data analyzed. Participants were provided a detailed research information sheet that explained the research and their potential participation (see Appendix C). The participant had the opportunity to ask questions, and have any concerns addressed. Participants' questions concerning the study and their involvement were answered to their satisfaction and confirmed on the digital audio recording.

Having had their questions or concerns addressed, and upon agreement to be included in the study, written informed consent was obtained by signature (Appendix D),

and the participant was asked to complete a basic demographic sheet (Appendix E). The data collected from the demographic questionnaire were reviewed, analyzed and compiled in table form in the findings section. Participants were provided with a copy of the information sheet and a copy of the informed consent form. Participants were informed of their right to discontinue the interview or their participation in the project at any time. One consent form was given to the participant; the other signed consent form was maintained by the researcher. A file that includes the signed consent forms, the demographic sheets and the participant identities is maintained in a locked file cabinet in the locked single-user office of the researcher. Data will be saved according to the policies of the University of Tennessee, Knoxville.

Interviews were conducted in a location convenient for the participant. The participant's home or the researcher's offices were most commonly used. A few interviews were conducted at an office belonging to the participant. To avoid interruption, the interviews were conducted at times when the participant would not be required to respond to an actual emergency. I also insured that the environment was quiet and encouraged the interviewee to make all possible arrangements to avoid interruption during the interview. The data was saved as transcripts containing no identifying information and in the NVivo 8® program on the researcher's password protected office and personal laptop computer to provide backup of the data.

The transcribed interview text served as the primary data. Participants were instructed to be honest and forthright to avoid the potential impact of social desirability on the data, and therefore, the findings. To protect the confidentiality of each participant,

only the researcher has a list of participants, and this information is maintained separately from the data. The participant was asked for permission to contact them after the interview for clarification purposes. This request was also in the information sheet, on the consent form and was confirmed on the digital audio recording. The transcriptionist signed a pledge of confidentiality (Appendix F).

Interviews consisted of semi-structured questions which allowed the story to be told from the perspective of the participant, but still allowed follow-up purposeful questions to be asked. Charmaz (2006, p. 28) spoke about this when she said that grounded theory interviews are “open-ended but directed.”

The opening statement and question were:

“I would like for you to tell me about a time when you responded to a multi-casualty incident to provide care. From the time you were sent there, to the time that you left the scene, how did you go about knowing what was going on around you?”

Follow up questions designed to illuminate the process of SA development included:

“How did you maintain updated information about what was going on around you?”

“What elements of the scene improved your ability to maintain or develop knowledge of what was going on around you?”

“What elements of the scene detracted from your ability to maintain or develop knowledge of what was going on around you?”

Variations of the last two questions were included in which the word “most” was used to determine what improved SA the most and what detracted the most. Many other questions were posed to participants in response to issues and concepts that emerged during the interviews.

Memos and field notes also provided important sources of data. Field notes were created during interviews as a way of insuring follow-up of important questions without interrupting the participant’s thought process and as a way of capturing an intangible, such as a perceived mood or emotion. They were continued after the interview to document the interview circumstances and any additional information that may have been important to remember for the next interview. Many times ideas that occurred to me concerning theoretical sensitivity and questions that I may have wanted to include in the next interview, were first documented in field-notes, and later found their way into memos. An example of my theoretical sensitivity was the use of more intensive questioning concerning the differences between responders’ perceptions of general preparation for response, those post-action activities which were the result of a particular response and the role of experience in preparing providers. Drawing upon a high level of theoretical sensitivity and using critical analysis allowed me to differentiate between these subtle, yet very important distinctions.

As a nurse practitioner trained in family healthcare, I was prepared to intervene in the event that a participant became emotionally distraught during the interview. In this

event, the interview would be discontinued temporarily or permanently at the discretion of the interviewee. I was prepared to refer to the local county mental health facility if needed. Fortunately, no interviewees became distraught or expressed any degree of discomfort during any of the interviews.

Data Analysis

Mixing the two complementary approaches of Corbin and Strauss (2008) and Charmaz (2006), I used multiple steps in the coding process. Coding is “deriving and developing concepts from data” (Corbin & Strauss, 2008, p. 65). These concepts are words or phrases of interest, which were coded or given a name that described each particular phenomenon. The types of coding used were, open, focused and axial.

“Open coding” (Corbin & Strauss 2008, p. 195), or “initial coding” (Charmaz, 2006, pp. 48-60) was used to break apart data in the first steps of analysis. “Focused coding”, a term used by Charmaz (2006, p. 57) was useful for identifying and sorting “the most significant and/or frequent earlier codes to sift through large amounts of data.” Combining the techniques of open and focused coding was useful in this study because of the large volume of rich, relevant data. Axial coding provided the means of reintegrating the categories by appreciating and explicating the relationships that drove the textual and diagrammatic depiction of the eventual substantive theory.

Combining these techniques added something important in terms of understanding of the grounded theory process and smoothed analysis. In vivo codes, which are words or phrases specific to the culture of the participant and required

interpretation, were also coded. The “culture” in this case was emergency healthcare workers.

In keeping with grounded theory methods, data analysis was accomplished while data collection was on-going. This was a significant benefit since interview questions and techniques evolved as the data emerged. Responses to questions, created other questions, which fine-tuned the process in order to obtain needed information and fully describe categories. This was an opportunity for “situational awareness” in data collection. I was able to evaluate what was effective, consider what may be more effective, and alter techniques to improve the collection of data.

Transcript interviews were coded using a line by line coding technique throughout the study. This technique allowed for close scrutiny of the content which was especially important for remaining open to what may be found in the process. Open coding provided the means to name each section of data in the interviews that appeared relevant, through the use of theoretical sensitivity.

Once patterns of activity were identified, incident to incident coding was added to line by line coding. Continuing the line by line coding prevented missing important data. Adding incident to incident comparisons allowed a more global view of how similar activities were handled by different participants. I like to think of line by line coding as a close-up photograph of data and incident to incident comparisons as the view of a section of data through a wide-angle lens. The technique of constant comparison was also used for the purposes of comparing incident to incident for identifying frequent and relevant focused codes (Corbin & Strauss, 2008).

As the number of participants increased many open codes were subsumed by focused codes. Focused codes were fitted and sorted through theoretical sampling and questioning until categories emerged which were then established, confirmed and abstractly named. The frequent and relevant focused codes became the properties which comprised and defined the category. The categories developed are composed of these properties and the properties themselves have dimensions. The dimensions describe the variation in, or the borders of the property.

In grounded theory analysis, categorical saturation occurs when no new data are emerging. During this study, it became apparent that theoretical and categorical saturation occurred with participant 12. I continued to sample through participant 15 to assure saturation of all categories. In allowing categories to emerge, it was important that they be sufficiently abstract to have the ability to encompass the meaning of the properties that comprised them. Axial coding was then used to realign the categories based on goodness of fit. Over 575 open codes were generated from the data with many more references to them. From this data, 11 categories (explained in findings) emerged that were used in the theoretical model (see audit trail, Appendix G).

I used the paradigm model of Corbin and Strauss (2008) to analyze conditions, actions, interactions and emotions representing the responses of individuals to the situations encountered, as well as the consequences of these actions interactions and emotions. Within a given category, questions related to each of these paradigms classifications may have been answered. However, once the category was established and

the properties and dimensions discovered one or more of the paradigmatic classifications was assigned to the overall category to assist with integration and theory building.

Memos were important pieces of data and proved extremely helpful during the analysis process in capturing and maintaining the line of thought about something in the data. There were many memos concerning thoughts, actions participants took, focused codes, categories, follow-up questioning, phenomena of interest along with many others things that served to remind me to re-address something important. The most beneficial use of memos in this study was the ability to have an on-going dialogue with myself concerning a concept or category, its properties, dimensions and relationships. During the course of such intense immersion in the data, it was difficult to remember every helpful thought or good idea that came to mind during the study. Memos helped to archive my thoughts for later use. Memos also provided the opportunity to relate components to each other in an on-going fashion, rather than attempting to visualize them all at the end of the analysis. This continuous reflection allowed categories and relationships to truly emerge, rather than being created or forced at the very end of analysis.

Theory integration was carried out throughout the analysis, beginning with the identification of a core category, which represented the main theme. Axial coding including multiple iterations of sorting and fitting used to identify categories, locate properties within categories and to relate categories to other categories was also used. Through these activities, the process of SA emerged.

The aim of the study was met in the development of a substantive theory related to SA development in MCI. The final storyline was developed in the move from

description to explanation, which is the difference between rich description and theory development (Corbin & Strauss, 2008). This theory was then textually and diagrammatically depicted.

Rigor of the Research Study

Qualitative research does not concern itself with validity and reliability in the quantitative sense of the words. However, that does not mean rigor is absent. There are several methods that are recommended to improve credibility (Creswell, 2003; Stommel & Wills, 2004) that were employed in the present study. They included taking part in a bracketing interview, the obtaining of rich data, peer-debriefing, member-checking, and utilization of an expert external auditor.

Prior to data collection, a bracketing interview was carried out to identify personal assumptions and biases. This was accomplished with a qualified researcher, who was my mentor on this research study. While my experiences should inform the research, they should not drive the results. The bracketing interview was transcribed and analyzed by both my mentor and myself and assumptions and potential biases were identified. I completely reviewed the summary of the bracketing interview multiple times before data collection began.

Every effort was made to prevent the premature closure of concepts prior to saturation. This was accomplished through sufficient engagement in the process and immersion in the data. Obtaining rich data was supported by an on-going fidelity to the particular methods that are unique to the research design, in this case grounded theory.

This included keeping complete records of interviews, an audit trail of coding, memos and field notes.

I used peer-debriefing by taking selected transcripts to a grounded theory group at the University of Tennessee, College of Nursing, headed by the person serving as the mentor on this research study. In these meetings transcripts were read and analyzed and coding suggestions offered. In addition, methods of interviewing, data collection and analysis were scrutinized. In at least one case, a transcript that I had previously coded was taken to the grounded theory group. The group then coded the transcript to provide my mentor and myself with a comparison of the group coding and my own. There was strong consistency between the group coding and my own. At another peer-debriefing meeting, my mentor and chair of this study, another of my dissertation committee members and the nationally recognized expert external auditor, Dr. Juliet Corbin, were all in attendance either in person or by teleconference. Taking part in peer-debriefing improved the mentoring process, the rigor of this study and my development as a researcher.

The nationally renowned grounded theorist, Dr. Juliet Corbin, served as an external auditor on this research study. She attended a transcript peer-debriefing and coding session via teleconference. She has also provided feedback on memos, storylines and models, as well as interpreted information concerning the application of her methods and clarified comments from her previous writings. We shared many conversations that improved my understanding of grounded theory methodology and data analysis.

Member-checking was used in an effort to get a sense of the theory fit from those who were actual participants in the study. Participants were contacted and offered the opportunity to participate in member checking. Seven participants agreed to participate. Member-checking requests were based on gaining a variety of viewpoints from diverse participants, similar to those outlined in the theoretical sampling description. Included were nurses, fire fighters, EMTs, and paramedics all with a wide range of experiential levels.

Member-checking was carried out by phone after the participants agreed to take part. They were sent the final theoretical diagram and during the telephone interview were provided with a relatively extensive explanation of the final theory. These sessions were approximately 30 minutes each. Several points were clarified and at least one change was made to the theory following a checking session. All participants felt strongly that the theory included their view of SA development in MCI. In an electronic communication with Juliet Corbin, she stated that in her experience participants were interested in “telling their stories, but are not so interested in developing the theory with you” (personal communication, April 1, 2008). Therefore member-checking was conducted for the purposes of assuring overall fit

Summary

Because the process of SA development was the focus of this study, grounded theory was the appropriate methodology for explicating the emerging process. The philosophical stance of pragmatism supported utilizing methods that practically resulted in uncovering the data, and provided evidence of that which was sought. Symbolic

interactionism posits that there are meanings conveyed in the personal action and interaction of individuals. Interaction seemed particularly salient to the situation at hand, and was therefore employed as a lens through which to view this research problem.

Multi-casualty incidents were defined for the project as those that occurred outside of a medical facility and that had injured between 2 and 25 persons. Participants for the project were responders educated and trained to at least the EMT level and who possessed at least one year of practice experience. Data collection included semi-structured interviews and used grounded theory techniques as posited by Corbin and Strauss (2008) and Charmaz (2006).

Interview transcripts, memos and field-notes comprised the data. Open and focused coding were used to develop categories which encompassed properties and dimensions. Saturation of the categories was insured. Memos and axial coding assisted with explicating the relationships between categories resulting in a substantive theory. Finally, research rigor was maintained by a combination of data immersion, thick, rich description, peer-debriefing, member-checking and through the use of an expert external auditor.

CHAPTER FOUR

Research Findings

This study sought to determine the process of SA in MCI. Grounded theory methodology was used for this purpose. This chapter constitutes the findings of the study. In this chapter I will describe the participants, provide the storyline and discuss the research paradigm used. Each major category (higher-level concept) will be described including the properties and dimensions thereof. The relationships that exist between the categories will be described. A textual and diagrammatic description of the resulting theory will be provided. An attempt to illuminate the analytical thought processes that shaped the decisions made will be offered during the course of the discussion. Words of the participants themselves will be used as powerful evidentiary support.

The process that emerged from this study is complex and cyclic. The process of SA occurs during an actual emergency response; however, it is always on-going on some level, even between responses. All of the activities that occur, both those during actual events and those in between emergencies, impact the development of adequate and actionable situational awareness, which leads to competent and safe scene management and patient care.

Participants

The participants were 15 emergency responders from the southeastern region of the United States. They were from multiple different jurisdictions in one state and from one emergency response organization with large regional jurisdiction in another state.

There were 12 male and 3 female participants and at the time of the incident that they chose to convey, all were trained to at least the emergency medical technician (EMT) level. All participants were Caucasian despite flyers being distributed to departments in which minority populations were well-represented.

Some participants were paid emergency responders, some were volunteers and some were both. Those who were both paid and volunteer were working for a paid department while volunteering with a local organization, typically a volunteer fire department. All but one were still working in emergency services at the time of the interview. One participant remains a firefighter but is no longer EMT certified. Some were dually licensed and/or certified. For example, some were both nurses and paramedics. The sample included a wide range of experiential levels and ages. The mean participant age was 37.13 years with a range of 22 to 52 years. The mean experience level in years was 15.46 with a range of 2 to 34. The names used in this study are pseudonyms to protect the identity of the participants. Table 1 summarizes the participant demographics.

The Storyline

The storyline is a narrative description of the theory. It provides an overview of the core phenomenon and the associated categories. The process of SA that emerged in this study is cyclic and has no clear beginning or end.

The story about the process of situational awareness in multi-casualty incidents is a story about establishing and maintaining control of dynamic, contextually-based situations, in an effort to provide safe conditions in which to provide patient care to

Table 1 Participant Demographics

N=15

Pseudonym	Age	Gender	Ethnicity	Full years of service	Type of Professional	Volunteer/ Paid	Currently working in emergency response
Mark	42	M	W	22	EMT/FF	P	Y
Ed	27	M	W	3	EMT/FF	V	Y
John	43	M	W	25	Paramedic	P	Y
Jane	43	F	W	13	Paramedic	P	Y
Frank	52	M	W	34	FF/previous EMT	P	Y
Mike	49	M	W	34	EMT/FF	P	Y
Kyle	36	M	W	17	Nurse/Paramedic /FF	P/V	Y
Jason	28	M	W	2	EMT/FF	V	Y
Dawn	36	F	W	7	Nurse/Paramedic	NA	N
Seth	38	M	W	18	Nurse/Paramedic	P	Y
Diane	30	F	W	4	Nurse/Paramedic/ VFF	P/V	Y
Jack	33	M	W	12	EMT/FF	P	Y
Dan	34	M	W	14	Paramedic	P	Y
Stan	22	M	W	3	EMT/VFF	P/V	Y
Bill	44	M	W	24	Physician	V	Y

Note. M= male; F = female; W = white; FF = firefighter; V= volunteer; P = paid; Y = yes; N =no

victims. Situational awareness (SA) in Multi-Casualty Incidents (MCI) is an on-going process.

There is preparatory activity for action that is relatively constant. What occurs in the interim between rescues or the “interval action” can be broken down into activities of two types. There are actions that may occur at any time, such as the formal educational preparation of responders, training sessions or drills attended by professionals, as well as simple discussions among responders (Interval Action – Ongoing). There are also more proximal interval actions that occur after a particular event such as personal and professional critiques, self-questioning and critical incident debriefing (Interval Action – Proximal). Both types of interval action, as well as experience derived from actual response efforts, the most highly valued experiences among responders, results in the accumulation of knowledge and experience that can be integrated into actionable plans.

Against the backdrop of experience, rescuers prepare for and respond to many types of contextually-based situations that place the health and lives of people at risk. Examples of these situations are motor vehicle accidents, shootings, structure fires, weather events and others. With the help of initial and updated information including many types of communication (Handling Information), rescuers appreciate the context, complexity and dynamic nature of a specific situation by anticipating and eventually perceiving the scene (Appreciating Context and Complexity). These scenes are further complicated by geographic and environmental factors.

Rescuers attempt to achieve and maintain a measure of control over the scene within their own situational world (Establishing and Maintaining Control). This core

phenomenon or category, serves as intermediary to the other categories and it is the category around which the primary activities of the response revolve. The mechanisms through which the rescuers establish and maintain control are establishing priorities, coordinating the efforts of multiple agencies and making decisions.

Information handling is an important aspect of SA throughout the response. Responders receive updates, collect information and disseminate information from a multitude of sources, and communicate with various persons and agencies. These mechanisms of communication include radio, face to face, hand signals, body language and others.

Responders have expected roles to play in the response effort. Roles include not only professional roles such as emergency medical technician (EMT), paramedic, nurse and others, but also the roles that a professional may play on their particular team. Policing agencies, the media and bystanders play important roles in the response effort as well. In addition personal and professional relationships impact the quality of the response. These relationships developed among rescuers impact the response effort in a positive way according to participants.

Responders manage resources, which may include personnel, supplies and time. They manage resources by assessing, calling, deploying, staging and sometimes declining the use of resources. On-scene resources must be balanced to provide sufficient manpower and avoid insufficient supervision and duplication of services or worse.

Responders recognize and feel the emotion that may be elicited when responding to scenes involving human suffering. They may be saddened, angry at the actions of

others or feel pressure to perform well (Human Element). They must detach themselves and compartmentalize those feelings in order to successfully perform their jobs. Most conveyed the need to deal with the emotional aspects of difficult calls after the response. Therefore, this category relates to the actual response and to the interval action.

The shared, common goal among rescuers is to insure the safety of all involved while providing care to victims of the incident. Safety risks are those that responders have traditionally been exposed to and newer threats posed by modern ideologies and technology. The safety of responders and non-responders alike are of utmost importance. Patient care involves assessing the mechanism of the injury, triaging, caring and the disposition of patients. Safety must be balanced with the risks of providing care. Safety and patient care also feed back into the core phenomenon of establishing and maintaining control through the assessments and decisions that are made. Therefore, experienced responders attempt to establish and maintain control of their situational world by appreciating the context and complexity involved, managing the available resources and handling and sharing information among the responders performing particular roles, while compartmentalizing the human emotions experienced, all in an effort to insure scene safety and provide patient care to those victimized.

The degree to which responders perceive that they have provided sufficient care while maintaining the safety of all, results in additional interval action; the proximal interval action which involves self-questioning and debriefing after the incident and contributes further to the background of knowledge gained from experience. Thus more experience is added to the background for future incidents. This experience along with

the activities accomplished during both stages of the interval action lead to additional preparedness. The process repeats itself in cyclic fashion.

The Paradigm Model

The paradigm model recommended by Corbin and Strauss (2008) was selected for use in this study. The model consists of conditions, actions/interactions/emotions and consequences. Conditions are “circumstances or conditions that lead” those involved “to a particular response” (Corbin & Strauss, 2008, p. 89). Actions/interactions/emotions “are the responses made by individuals or groups to situations, problems, happenings and events” (Corbin & Strauss, 2008, p. 89). Consequences are “outcomes of inter/action or of emotional responses to events” (Corbin & Strauss, 2008, p. 89).

These paradigmatic classifications allow the researcher to place codes or categories into each classification, based on the questions they answer, thus assisting with analysis. The final theoretical categories were assigned a paradigmatic classification. However, codes within the theoretical category may have answered questions in multiple paradigmatic areas. The names of theoretical categories do not necessarily denote their classification within the paradigmatic model. According to Corbin and Strauss (2008), it is up to the researcher to explain the paradigmatic classification assignment to each theoretical category. For example, the core category, establishing and maintaining control, was the category around which all other theoretical categories revolved and with which they all interacted directly or indirectly. Because the primary properties of this theoretical category were establishing priorities, coordinating efforts and making decisions, it was assigned to the paradigmatic classification of action/interaction/emotion.

Open, focused and axial coding were utilized to determine codes, to refine them and to sort them according to best fit. Sorting and fitting went on throughout the research process. In some cases properties of one category were broken out and became a category unto itself. In other cases, categories were collapsed and became properties of other categories. The qualitative data management software program NVivo 8 ® from Qualitative Solutions and Research (QSR) international was utilized to assist with data management. Theoretical sampling allowed for the saturation of categories, thickness of description and for increasing variation among properties and dimensions. Table 2 provides a brief overview of the categories, properties, dimensions and paradigmatic classifications that emerged, comprised the theory and were then used to depict the theory diagrammatically.

Theoretical Categories

The theoretical categories represent the higher-level concepts comprising the theoretical model. They possess properties that vary along certain dimensions. The dimensions explain the variation within each property. I will now explain the theoretical categories before moving on to the relationships found amongst them.

Experience

Experience is defined as the culmination of knowledge and ability derived from actual emergency response efforts. The properties of the category include; the significance of experience and the benefit a responder derived from experience. While the process of SA is continuous, for explanatory purposes the experiential background of

Table 2 Categories, Properties, Dimensions and Paradigmatic Classifications

Category	Properties	Dimensions	Paradigmatic Classification
Experience	Significance of experience	Unparalleled in terms of preparation	Condition
		More important than classroom education	
	Benefit derived from experience	Can be of utmost importance, but only as a “frame of reference”	
		Necessary experience	
Interval Action Phase I - on-going	General preparation	Prevents “tunnel vision”	Condition
		Formal education	
		Training, drills	
		Event pre-planning	
Interval Action Phase II – proximal	Actions based on particular response efforts	In-service training of fellow professionals	Condition
		Formal Critical Incident Stress Debriefings	
		Formal performance debriefs	
		Informal performance critiques	
Contextually-Based Incident	Mechanism of Injury	Self-questioning	Condition
		MVA Shooting Weather Event Heat –Related Injury Multiple poisoning/ Overdose	
	Numbers injured	2-24	
	Location	Roadway, home, business	

Table 2 cont.

Category	Properties	Dimensions	Paradigmatic Classification
Appreciating Context and Complexity	Dynamic nature of events	Chaos and confusion vs. routine Unexpected occurring	Action/Interaction/Emotion
	Anticipating and envisioning the scene	“preparing in my head”	
	Perceiving the scene	“scene triage”	
	Geographic and environmental conditions	Scene spread out, hindering assessment “muddy”, “dark”, “cold” “Smoky, very hot”	
Establishing and Maintaining Control	Degree of control	“Well controlled” vs. “no control at all”	Action/Interaction/Emotion
	Accepting responsibility	The burden of control IC vs. patient care (role) (situational world)	
	Establishing priorities	Safety, patient care, resources	
	Coordinating efforts	Agencies, personnel Cooperation vs. “two different purposes”	
	Decision making	Affected subsequent decisions Pressured, time-constrained, rapid, incomplete information	
		Gravity of	

Table 2 cont.

Categories	Properties	Dimensions	Paradigmatic Classifications
Handling Information	General	Too much vs. too little	Action/Interaction/Emotion
		Multi-sourced	
		Timing	
	Initial information	Changing, conflicting, unclear, intentionally misleading Dispatch, “still alarm”	
		Receiving updates	
	Communications	Timing	
		Inhibiting and facilitating	
		Proximity of providers	
		Busyness	
		Radio, face to face, hand signals body language	
Roles and Relationships	Professional roles	EMT, paramedic, nurse, doctor	Condition
	Team roles	IC, patient care	
	Interaction roles	Media, bystanders, witness, policing personnel	
	Relationships with and among providers	Established and non-established personal and professional relationships	
Managing Resources	Personnel	Sufficiency, deploying, assessing, distributing, calling for additional, canceling, matching, utilization of	Action/Interaction/Emotion
	Equipment		
	Time		

Table 2 cont.

Categories	Properties	Dimensions	Paradigmatic Classification
The Human Element	Emotions experienced and the impact on responders	Sadness, anger frustration, desire to help, empathy, shock	Action/Interaction/Emotion/
	Methods for managing emotions	Compartmentalizing, “crying after the call” Clicked into a mode” “flipped a switch” “block it out” Positive and negative coping	
Safety	Goals and Priority of Safety	“safety is the first priority”	Condition
		“make sure everybody’s going home”	
		Balancing safety vs. “I’m gonna take care of myself”	
	Threats to safety	Traditional vs. newer threats	
Patient Care	Triageing	Assessing, blocking traffic, reflective vests, placards	Consequences
		“not being too quick”	
		Differences in MCI “you’ve got to move on”	
		Assessing numbers and priorities	
		Initial and reassessment	
		Mechanism indicating injury – patient specific Shooting, blunt and penetrating trauma, poisoning/overdose	

Table 2 cont.

Categories	Properties	Dimensions	Paradigmatic Classification
	Caring	Locating patients <i>a</i> priority, not necessarily <i>the</i> priority Treatment of injuries Releasing or transferring care Matching provider to patient condition Seeking Advice Discontinuation	
	Disposition	Mode of transport Transport time Being overwhelmed Transporting in a truck bed Setting up central location for Matching to facility capability	

the individual involved serves as the starting point. It is the background category against which the other activities of SA occur. Experience is highly valued by the participants and is therefore fundamental in terms of its impact on the action of the individual responder during actual response situations.

Significance of experience. Participants did not respond to emergency situations as blank slates. They were shaped by their previous response experiences. Experience was seen by providers as being unparalleled in terms of its ability to impact how a responder performs. Participants did not ascribe the same weight of experiential benefit to formal education and training programs as they did to emergency response experience. It was the actual exposure to emergency situations that they saw as improving their abilities and honing their skill. Speaking to this very issue while discussing a valuable patient care lesson, Diane, an EMS provider said, “that’s not something that you teach in school.”

Experience was seen as more than sitting in a classroom and learning about responding. It was achieved by responding. Supporting this idea is a quote from Jack, a firefighter who was entered a burning building in an effort to rescue a family reportedly inside. He was driven back by a flashover, a fire that engulfs the whole room. He described how only experience could teach him about a flashover when he said, “Like a flashover....there’s nothing you can read that can prepare you for that.” His experience taught him like nothing else could.

Formal modes of training were seen more as preparing one to experience, rather than providing direct experience. Seth, a flight nurse was comparing formal education to

experience. He said that experience was worth twice what education was worth. The following is a portion of his actual response to a question about the impact of experience on the ability of one to achieve and maintain SA.

I think experience um, probably is at least, you would double the amount of education. I think you give me somebody that graduated top of their class that made 100 on every one of their exams and you give me somebody that has five years' experience and you say you're about to go on one of the worst calls you ever went to, I would take the person with five years' experience I think.

Another participant, Jason, a young EMS provider, added another dimension by suggesting that the value of a response experience can only be measured against another actual incident. He found himself in the middle of a very chaotic situation initiated by a weather event. He said, "This is probably the first mass-casualty incident real-time that I've ever experienced. So I.... until another one happens I won't have much to compare it to." This last comment strongly indicated that the life experience of actually responding to an emergency is more highly valued than simulated training for improving rescuer performance.

Darrell, an EMS provider offered an explanation for the fact that experience influenced responders like nothing else could. In a member-checking session he told me that in a drill or simulated event, the rescuer knows in the back of his or her mind that it is not real. It may be an excellent exercise, but is none-the-less simulated. However, in a

real emergency the sense of urgency and the knowledge that the decisions made really count in someone's life, made the difference. Actual response efforts solidify experience and allow more influential integration into the cognitive response model of the rescuer.

Benefit derived from experience. Not only was an actual response the benchmark of experience, but it was universally seen as very helpful to the response effort. There were enough commonalities among contextually similar situations, that when one experienced them, it improved a provider's performance on the next similar event that he/she encountered. Mark, a well experienced fire captain, said simply, "been there, done that," to suggest that common situations will be similarly approached and therefore experience with a similar situation was very helpful.

However, a variation on this theme that provided dimension revealed itself during questioning about experiences in some of the latter interviewees. Some providers felt that while it was important to appreciate experience and that it is indeed helpful; it is helpful only to the extent that the provider recognizes that it is a useful "frame of reference." Participants did not feel that previous responses efforts provided an absolute pattern that could simply be followed blindly every time they responded to a contextually similar event. In fact, one responder warned that trying to pattern match to the point of not appreciating the nuances of a particular event, would be like "trying to plug that square peg in a round hole."

So while there are definite similarities among responses, many rescuers warned that there is also sufficient difference among even similar situations, so as to require discrimination of the particular circumstances of an event and the actions that follow.

Mark said, “there’s no way that you can be prepared for everything and anything that you’re going to encounter in the field,” Experiences, while offering a mode for inter-response comparison, must still be approached individually. Relying on one’s experiences entirely, could nullify the very impact of experience, by preventing the gaining of new ones through a close-minded approach.

Some basic experience was actually necessary in order to gain additional experiences. A flight crew member told me that they only accepted crew members after having had a certain amount and type of experience. Paramedics needed three to five years experience to join a flight crew, while nurses needed the same, but it had to be in critical care. In this case, experience could not be gained unless other foundational experiences already existed.

Experience also helped providers to see the big picture and avoid getting “tunnel vision.” According to some, one had to work for some years in order to develop a “multi-dimensional” view of the scene before them. Part of the avoidance of an overly narrow focus, was the ability to anticipate, which many providers suggested came with experience. A lack of experience led to the inability to anticipate worsening conditions and therefore reduced effectiveness. Another young responder, realizing he didn’t have something he needed during an emergency said, “So, that’s something I put in the back of my mind for next time.” Some younger less experienced providers may even place themselves and thus the entire response at risk for lack of this ability. Within the paradigmatic model, experience is a condition that exists at the time an incident occurs.

Interval Action

The category of “interval action” is defined as the action and interaction occurring between emergency calls carried out for the purposes of improving response or those actions that are the direct result of a response. These activities, when combined with the experiential history of a provider result in a basic level of preparedness that a provider brings to an emergency call. This category is divided into two distinct phases. One is “interval action – ongoing” and the other is “interval action – proximal.” These two phases began as one simple phase in which all inter-response activity occurred. However, as interviews and analysis went on it became obvious that the actions were varied based on whether or not they occurred randomly without respect to particular emergency calls or whether they were occurring as a direct result of an actual response effort. The properties of each phase of this category describe the actions taken.

Interval action – ongoing. The primary property of this phase of interval action is formal efforts not based on a particular call or random preparation designed to improve response. These random actions included formal educational and training activities such as those that generally prepared one for the particular job function that they perform (EMT, paramedic, nurse etc.) and those that are inter-professional and cooperative training that might occur between sister volunteer fire departments. Another example mentioned by multiple flight nurses was the training that they conduct for volunteer and paid fire departments on helicopter safety, including how to set up and command an adequate landing zone. There were also activities that were undertaken in planning for an

event. Pre-planning was distinct from interval action-proximal because an event may be planned for, but with no assurance that any particular emergency may occur. While it may seem that pre-planning for an event is not so different from dealing with the aftermath of an event, the difference is that with pre-planning, there is the lack of event type specificity that can be known. Planning had more to do with where to locate emergency responders. A participant suggested that he planned ahead whenever he was going to be at a large public event by carrying gloves or other supplies. The pre-planning in this case is not done with the knowledge that a particular event would occur, but was accomplished as a means of being generally prepared.

Interval action – proximal. The primary property of this phase of interval action was action which occurred in close proximity to and was the direct result of particular response efforts. The first of these were formal debriefings where crews or individuals would get together to formally discuss what had happened with each other, with superiors, or both. These activities could be standard procedure or they may be driven by the potential of the event to cause emotional suffering among rescuers.

Attendance at these formal debriefings seemed to be affected by cultural and political implications. In the case of voluntary critical incident debriefing, when younger, impressionable responders saw more experienced providers choose to either take part or not take part in them, it impacted the younger responders. This was the impression of several participants. Darrell, an EMS worker expressed it this way, speaking about an emotionally difficult call in which a fellow emergency responder was killed.

Well, my partner and I, the others were invited. The other fire department that was there, they were invited. Um, the other police officers had a separate one. But the fire department was invited to come to ours, but I've always noticed with the critical incident stress debriefings from other bad calls, the fire departments don't come. I think it's a cultural machismoyou know, big man the firefighter can't cry, can't get upset.....Um, I've been to quite a few CISMs and they, if they do come they don't participate.

In discussing the impact of cultural norms even within his own department, he went on to say,

And I said yeah, I want to go. And my partner's like, well should we go? And even my supervisor, again, he's, you know, I hate to use the term old-school, he is. He's been in the field 25 years. And he looked at him as for advice. Kind of the olderand said, would you go? And he said naw, I wouldn't go to that.

One responder expressed concern that the political ramifications of debriefing may have prevented it from happening. The incident involved a relatively popular tourist destination. The circumstances, had they come out in the media, could have cost the particular location tourism income. He said, "you honestly think that they're gonna expose a problem with their cash cow?" So, there are factors other than the need for quality assurance at play in terms of debriefings actually being conducted.

Critiquing and self-questioning were informal mechanisms by which providers examined themselves and their close professional peers. In some cases they would make plans for how to improve their performance the next time. Mike, a well-experienced fire fighter said this about these informal meetings.

Regardless of how large or how small. Uh, one of the things that I did building a crew that I was one at the fire station, and I think I've done pretty much all through my career that I found that works, is like I said earlier the only way you're gonna get better is identify stuff that didn't go well and be able to make that better. The stuff that you got right you don't need to improve on. It's the stuff that you didn't get right, and on this particular incident I remember walking back in the station after everybody'd left and saying, okay, what went right, what went wrong, what do we need to do better? And the crews that I've, I guess managed, and most of them been on, even as something as simple as a car fire, we come back and say what went right, what could go better. And we developed a lot of stuff, little stuff, from that.

Another responder said:

I'm overly hard on myself after a scene. When I go home after a fire I play it through my head. I'm sure most responders do this, and after a good size wreck I go through my head and see if I think I did everything right. And after, I still go

through that and I still say what could I have done different, what didn't I do?

What did I forget to do?

There were many more examples of these informal critiques and self-questioning sessions. This was a strong reason to separate interval action – ongoing, from interval action – proximal. The separation of these phases of the category of interval action helped to locate the activities, or properties of each phase in time and space in relation to the response activities. The actions during the interval, both on-going and proximal, led to conditions of preparedness against which providers responded.

Contextually-Based Incident

This category is defined as the context of the emergency to which the provider responded. The properties of this category are the mechanism of risk or injury, the number of patients and the geographic setting. The onset of an actual emergency call is triggered by circumstances that are highly contextually-based and therefore result in a condition to which rescuers respond.

Mechanism of injury or risk. Emergency events can take on any number of dynamic contexts based on the mechanism of risk and/or injury, how many are injured and how severely, the number and type of responders, the geographic area in which the event occurs and innumerable additional factors. Theory can only be based on the contexts about which participants spoke. However, multiple types of events were theoretically sampled for to provide dimensions and thus as much variation as possible. While participants were asked to tell the story of a particular event that stood out for

them, they were free to discuss any event or concept that they felt may be helpful, and in some cases they strayed from a particular event to more general application of concepts. Table 3 summarizes the type of events participants discussed and the number of casualties that were involved.

Number of patients. The number of people injured or potentially injured affects the type of response that is mounted. The number of those reported injured and the number actually injured were in some cases different. The mean number of patients per incident was 6.20, with a range of 2-24.

Location. Where an emergency response occurred affected the context of the emergency call. They occurred in homes, businesses and on the sides of busy roadways. These properties were taken into account in the response effort.

What participants said about the situation to which they responded was often very dramatic. The fact that the particular situation stood out for the participant seemed to infuse the story with a helpful dose of detail, that made the story come alive. The circumstances to which the participants responded many times conveyed the drama that would await them upon their arrival to the scene.

Frank, a long time fire fighter and former EMT, responded to a triple shooting. He related:

He shot one person inside the building, uh, came out and somebody else had gotten in a car, he shot – the person in the building was dead – shot the guy in the

Table 3 Contextually-Based Situations Related by Participants

Type of Situation	Number of Casualties
MVA	4
MVA	4
MVA	24
MVA	2
MVA	5
MVA	2
MVA	2
MVA	8
Shooting	4
Shooting	3
Weather Event	11
Weather Event	11
Heat Related Injury	2
Fire	4
Multiple Poisoning/Accidental Overdose	11

Note. MVA = motor vehicle accident $M = 6.20$ casualties/situation

car on the left side, uh, right about his kidney level, uh, he was still alive, shot him through the window, and he shot himself right in the sternum.

Jack, a young fire fighter told of a particularly intense situation to which he responded saying:

So we got on our gear, jumped on the truck and immediately upon pulling out of the station we could see the red glow of the fire. So we knew we had something working. So we get to the fire and my partner and I that are in the backseat jumped off the truck and um, there was a man standing outside. He happened to be an off-duty police officer. And he said I know the people, and they're still inside.

Dawn, a flight nurse who is dually certified as a paramedic, flew to a scene only to be presented with the following:

And we were told that it was two approximately 17 month old infants. One female and one male. Um, the quick story that we were given was that the father had been working night shift, came home, um, to take the kids to daycare for mother while she went to work, and somehow the twins were left in the SUV that was parked in the hot sun, um, in the driveway. And when daycare called approximately around 12:00, 12:30, to - wanted to know where the kids were,

where the twins were, he went out to the vehicle and found the babies in the car, still strapped in their car seats and the female was unresponsive.

Kyle, another flight nurse/paramedic responded to the scene of a particularly gruesome accident. He said, “we were responding to a pickup truck, uh, mid-size pickup that ran off the road and ended up with the passenger impaled on the horizontal portion of the chain link fence.”

The contexts of the situations to which responders were called were extremely challenging and incredibly varied. This context drives much of the response effort. It also had a tremendous impact on how responders went about appreciating the contextual complexities of a particular situation.

Appreciating Context and Complexity

The category of appreciating context and complexity is defined as the actions taken by the participants to grasp the meaning of the situation and to begin to appreciate how the situation may be controlled or may become out of control. Properties that lead to a greater awareness of what was happening on the scenes and thus comprised this category were; appreciating the dynamic and many times chaotic state of the event, the responders’ anticipating and envisioning the scene before arrival, perceiving the scene upon arrival and the geographic and environmental considerations of the scene.

Dynamic nature of the event. One of the more important properties of this category was rescuers appreciating that multi-casualty scenes are dynamic. Situations continued to evolve on their own and in response to rescuer influence. On their own, the

scene tended to degenerate as more people could be injured or exposed to whatever the mechanism of injury was originally, the influx of bystanders and the uncontrolled setting. However, each case may also be influenced by the attempts to appreciate the context, because early decisions that were made impacted the ability to appreciate and ultimately control the scene (see discussion on establishing and maintaining control).

Situations were dynamic. Being prepared for change meant expecting the unexpected. Even when one felt prepared because of pre-planning, there were factors that could alter the situation dramatically. Jane a high-level supervisor was involved in pre-planning for an event which would draw upwards of 80, 000 spectators to an air show. She acknowledged the risks of this type of event. However, what actually ended up being the mechanism that injured 11 victims and caused the death of another, was the very thing that had not been planned for; a weather event. She expressed it this way:

You know, in my mind a crop duster's going to come out of the sky possibly and take out a large group of people. I certainly wasn't expecting a weather event. We weren't really expecting any weather that day.

There were no warnings for a weather event in the area that day until the storm actually began to stir minutes before it struck. So, although she had prepared for the event, and her team was responding to other various medical requests for care due to the large crowd, the overall situation remained highly dynamic.

Because of the dynamics, responders frequently cited that these scenes, when first approached, seemed overwhelming. Several responders suggested that they seemed “chaotic”, and many references were made to either chaos or confusion with regard to an emergency scene. It was clear that some responders had to admit this even though they were uncomfortable saying so. Jason revealed this when he said,

I knew that this number of tents blew over, there’s people walking around, the rain is pelting you, it’s, it’s just, I don’t want to say chaos because I didn’t feel like it was chaos. I knew what was going on, but it was a chaotic scene I guess.

Jason suggested that his actions in understanding and acting on his environment were not chaotic, but that the scene was.

Other providers described this issue of chaos and confusion by saying the scene was “surreal”, that they had their attention divided many ways and that there were many considerations that had to be taken into account; all at once. One participant even spoke to the fact that the passage of time may be altered because of the confusion saying, “time kind of gets skewed when you’re in the middle of that.” Many participants clearly saw these responses as disorienting and complex.

A negative case provided dimension. John, a well experienced EMS provider responded to a shooting in which four people were injured. He calls the scene, “pretty cut and dry.” Part of the reason for this was, he was appreciating the context early through the dispatch information provided him. When he responded to the scene it offered him

few changes from what he had anticipated. He expected something and that is what he got.

Other participants suggested that the dynamic nature of an MCI means that at times, the last thing you expect to happen, may happen. Most responders expected that those who had been victimized by an event would welcome help. This was not the case with Ed, an EMT who responded to a single vehicle accident in which multiple people were injured. He reported this: “I would have never thought somebody that went through a car wreck would have ran off in the woods, especially a car wreck that severe.” His patient not only didn’t want the care he offered, she didn’t want to be found. He explained further: “she was hiding ‘cause she was scared, number one. Number two she was intoxicated and number three she had a warrant out for her arrest.” When these rescuers were on scenes, at times what actually happened, was not what they anticipated. This leads to what rescuers expected to find. Another major property of appreciating context and complexity turned out to be “anticipating and envisioning.”

Anticipating and envisioning. The rescuers were able to anticipate and mentally visualize the event before actually arriving on the scene, usually after receiving initial dispatch information (see handling information). There were basically two dimensions to this property. First, participants used the information that they received over the radio traffic and other indicators to anticipate the seriousness of the scene. In some cases they requested additional resources. Secondly, they used the information to refresh themselves on what they might need to do when they got there, even going as far as visualizing in their minds the actions to be taken.

Participants used cues to anticipate seriousness. Mark, a fire fighter captain upon simply seeing the traffic pattern while responding, began anticipating the worst. He said, “Traffic backed up, you know, Highway B was basically shut down. Uh, probably gives you a pretty good indication that you got something bad from that standpoint.”

The radio traffic surrounding a scene could also be an indication that a call might be serious. Bill a physician EMS director, who actually responds with the crews he oversees, spoke about the dispatcher and said:

“And so I can tell that she was getting calls that this was a serious deal. Especially as we kept you know calling out more and more fire departments.....You know, it’s like, okay is this, obviously a number of casualties, uh, initially, or potentially.”

One responder stated that when there was reduced radio traffic from those on the scene, this also might indicate something serious, because those on the scene were too busy to talk.

When preparing for a particular event or in the midst of responding to an emergency call, rescuers ran action plans through their minds in order to prepare, anticipate and avoid being caught off guard. Ed, when responding to a vehicular accident said, “I was preparing in my head before I got on scene what to expect.” Diane, an EMS responder, speaking about the time between dispatch and arrival, had this to say,” I use that time to bring everything to the front of my head, what I’m going to need to do, what

I might need to do, what resources I might need to utilize when I get there.” Diane also mentioned that she knew some providers who intentionally avoided this type of pre-arrival planning, because, as she put it: “some people don’t even listen to dispatch information and they just wait to see what they got on scene. ‘Cause a lot of times our dispatch information is inadequate...or inaccurate I mean.”

This ability to anticipate events occurred in pre-planning for a larger scale event. Jane, while planning for a large-scale public gathering said, “we were preparing for a mass casualty incident because that’s pretty much what it was in my mind. It just hadn’t happened yet.” She was anticipating what may happen.

Perceiving the scene. While anticipating a scene was a critical property of the category of appreciating context and complexity, responders also suggested that to appreciate the scene fully, actually visualizing it was critical. The most important dimension of this property was the initial visual scene size-up. Mark, said, “initial assessment is, to me, has always been the most important, because, I mean you, you just from mechanism of injuries and stuff like that, you can tell. I mean when you get on scene.” He went on to say, “That, that first, initial reaction, or that first assessment of just, when you look at what you’ve got, and you may not be able to see everything.” Summing it up later in the interview he said, “you know you kinda gotta go based on what you see.” Another provider, Mike, confirmed the importance of visualization in his comment:

Uh, again we’re looking at the damage to the vehicles. Uh, you know, has airbags deployed, is there side impact, uh, is there passengers where the impact is, uh, you

know obviously is someone ejected or are people scattered about, or are they all still in the vehicle. Is anyone getting out of the vehicle, have we went from in the car to walking wounded, you know? All this is during your initial triage, actually before my feet actually ever hit the ground, normally getting out of the truck.

He went on to refer to this process as a “quick scene size-up,” and “establishing that which lays out your work scene.” Finally Frank described it as triage of the scene.

Nurses and other providers often think of triaging patients, but he was actually visualizing, assessing and sorting the needs of the scene. He said,

So, you know, you would uh, just do sort of a scene triage I guess you would call it. Uh, very first thing we’re gonna do is we’re gonna make sure the people are gonna be safe, whether it’s blocking the road with a truck, or you just assessing what’s going on around.

Some providers said that visual assessment could be problematic because the scenes may be very spread out. They also mentioned that visual inspection was difficult when it was dark or when, for example a car was far off the road, especially when the patient had already been moved. In this case, one may not be able to visually inspect the mechanism of injury, which indicates that visual inspection of the “scene” did not take place.

Geographic and environmental factors. Final properties of the category of appreciating context and complexity are geographic and environmental factors. Visualizing the scene was viewed as critical by most providers. Geographic and environmental factors were frequently cited as making these assessments, along with other aspects of situational awareness acquisition and scene management, more difficult.

One of the most frequently mentioned issues in terms of geographic factors was that a scene may be very broadly spread out or can be in one very small area. Rescuers felt that scenes that were widely spread out were more difficult to appreciate simply because of the physical separation of components. Some responders discussed them as “two different scenes.” Physical obstruction was encountered by Frank, a fire fighter responding to a shooting. When asked what the biggest hindrance was with respect to knowing what was going on, he said: “Uh, I guess having two different locations, one inside and one outside. Would probably be the biggest thing.....not being able to see them both together and being able to put them both together.”

This separation was sufficient in some cases for rescuers to treat them as two separate scenes. Jane discussed looking over the large area that she was responsible for and said:

And, originally when it first happened I remember standing on the hill and I was looking over at the army tent which was way over there and then I looked down here at the demolished VIP tents and they were way over there and it really, it was two separate incidents at that moment.

Responders also saw environmental conditions as a factor in appreciating context. Working in the external environment made a difference in one's ability to appreciate the scene. Many factors were mentioned like "out in a rural area", "muddy", "dark" and "cold." All of these descriptors added to the difficulty in grasping exactly what was happening on the scene. Jack, a young fire fighter, spoke of dealing with the environmental conditions himself, yet expressed his empathy for those who fell victim to the fire to which he responded. He stated; "It was very smoky, very hot, very, very hot. So, I mean if I could feel the heat in the gear I was in, I can't imagine what it must have been like with them in the house like that." Four people died as a result of this fire, one of them a pregnant woman.

Responders appreciated the context and complexity of scenes by acknowledging that they were dynamic, prone to rapid change and in some cases were quite chaotic. They anticipated and envisioned what they would find and what they may need to do prior to arrival. Actually visualizing the scene was one of the most important aspects of figuring out what was really happening and participants did this while dealing with the geographic and environmental circumstances of their particular response.

Establishing and Maintaining Control

"Establishing and Maintaining Control" was the core phenomenon and the category around which all other categories revolved and with which they all interacted, either directly or indirectly. This category is defined as the actions taken to determine the degree of control, accept responsibility, establish priorities, coordinate efforts and

decision making. The major components of the definition are the properties of the category.

Responders must perform many functions from appreciating context and complexity to managing resources and handling information. However, participants did all of these things in an effort to control the portion of the response for which they were responsible. Their area of responsibility was what I have termed the responder's "situational world." This distinction is important because each responder may have an entirely different function in the response effort. A fire captain may have overall operational control of a scene and therefore serve in a role that responders referred to as the incident commander (IC). On the other hand, an EMS provider who arrived after the fire department may be charged with the care of the most critically injured patient. Each responder must accept responsibility, establish priorities, coordinate efforts and make decisions about the situational world with which they were charged.

The degree of control. Establishing and maintaining control included the degree to which one had control of their situational world. Some scenes were seen as poorly controlled by the participants. One flight nurse said that they responded to a confusing scene to find that "there was no control at all." However, another participant when asked about what made the scene run smoothly and what improved situational awareness, said, "a well-controlled scene." When the scene was not well-controlled, participants expressed that the problem in most cases was the lack of clear leadership.

Assuming control was difficult to some, especially when it involved assuming control of the overall incident command. One experienced provider was openly

empathetic toward anyone having to take on this responsibility saying, “you know, you always feel sorry for the initial IC because he’s got anything and everything to do right there.” If the situational world of the participant was overall scene management rather than simple patient care, the responder felt that it took more effort to accomplish that level of control than to deal with a single patient.

Some examples of participants’ words include, “it takes a while to develop the multi-dimensions to look at,” meaning that those who have IC responsibilities have more issues to be aware of than someone providing individual patient care. Jane was in an IC position during a major event and said this about the task of not caring for patients in an effort to maintain control, “it took some restraint.” She and others suggested that when providers come up through the ranks, many times they have had years of patient care experience and that this function could be hard to let go of. Speaking about her role as a leader she said,

.....in my situation it’s higher than that. Now it’s, you know, resources, resources, research, transportation. It’s all these things, so you just have to step above that, that wanting to drop everything and go give Band-Aids and go take care of people and so you’re dealing with a bigger issue.

Mike offered this on the subject:

....if you're responding on it, you've usually got a captain or a, or in some cities a lieutenant, or you got an officer. And, and one thing that you can't do is tunnel vision in and focus directly on the patient. Uh, that's what you need to assign your other personnel to do and let them report back to you. Because there's too much of a big picture from, do I have, is traffic driving around us causing my guys to be in a situation where we might get hit, uh, are my other resources coming appropriately. Can I communicate with the communications center. If we have a lot of patients, making sure that maybe the transport agencies are notifying the hospitals of the number of patients we have so they know, or if we got anything that's specific looking at that.

Those who had primary patient care responsibilities also felt that the role they performed was critical.

Accepting responsibility. No matter the task, responders made many references that indicated that they were accepting responsibility for their situational world. In the case of accepting responsibility for an entire scene, Mark said, "as the captain on the truck, you know, initial, uh, incident command was mine." John, a volunteer fire fighter said, "I took IC over, over the one scene." He went on to say, "So I was responsible for every aspect of it."

Even in patient care situational worlds, responders made comments suggesting that responsibility had been accepted. Frank, an EMS provider describing to me why he

took the most critically ill patient simply said, “I was the paramedic on the ambulance.”

Accepting responsibility seemed an important decision to these providers.

Establishing priorities. Another important property of this category of establishing and maintaining control was establishing priorities. Responders indicated that surveying the scene helped in deciding where priorities existed. These priorities mainly surrounded patient care and safety. However, some participants mentioned that establishing priorities meant making sure that resources were well matched to needs. Another participant mentioned the need to establish priorities, “so that I could radio in to uh county fire, that’s our main radio channel to make sure that all the responding units had the best picture of it possible.”

Many participants mentioned prioritizing patient care. Mark, discussing how to establish scene control said simply, “it comes down to priorities”. He went on to offer an interesting insight. He said that when you have a complicated scene, you start from the outside and work in and so, “you start dealing with it as you, as you make it smaller.” This comment indicated that you can only prioritize what you can safely access.

Coordinating efforts. An additional property of this category was coordinating efforts. Many participants provided examples of the cooperation necessary to make a rescue effort work. John, an EMS provider, said, “but we’re fortunate enough here in this city that we work very well with our, with our fire department.” He went on to say, “We’re really fortunate in this city that the three agencies work real well together.” Mark, speaking to the importance of coordination said, “There, there, there are certain, there’s

more coordination if nothing else that's got to be considered. Uh, for example, uh, you know I mentioned the fact of multiple units that we had to request."

Most participants felt the cooperation with other agencies was very good with one participant saying, "99.9% of the time it's seamless." This included EMS, fire department, policing agencies, helicopter services and others. Participants felt they were able to "put those egos aside" and understand that "nobody's in a turf battle. "

However, there was at least one episode where a participant felt that the separate functions of two agencies interfered with each other. John, who was trying to provide care to patients, felt that he got less than full cooperation from the policing agency with which he was responding. In discussing the fact that he was providing care and the officer was merely investigating, he said they had "two different purposes."

Decision making. Finally, a property of this category was decision making. Decision making is part of the process of SA because as decisions are made and actions carried out, fundamental changes occur in the situation. This means that new situational awareness must be obtained from the set of circumstances that are in part, the result of the decisions that have been made. Decision making impacts and creates SA.

The decisions that must be made in emergency response situations were many times made rapidly, under a great deal of pressure and with incomplete information. The decisions involved issues including; deciding on which resources to utilize, how best to transport patients, which personnel should care for which patients and many others. These determinations and choices carried very serious consequences. In one case, a young fire fighter was told not to go back into a potentially unsafe situation to avoid risk

and to avoid damaging an investigation. He told me of the decision of his superior officer:

So we came back out and he asked me the condition of the patients inside. Asked me if I thought they were alive or dead. And I told him that it appeared that they were dead, but I wasn't sure. And he asked me if there are any chance that they could be burnt. And I said no, that we had the fire knocked down there's not gonna... be burned. And he told me to leave them in place because of the uh, I guess when they do their investigation they wanna see where the victims were found. And uh, because there was probably no chance that they were alive.

The gravity of these decisions can be seen in the words of Mark, a fire captain who said:

I hate hazmat scenes. I hate them. I've never liked hazmat, I've never liked the fact that you can be standing here and your face melting off and you never, you never smell anything, see anything, nothing. That's always been a problem for me. So, you take a hazmat situation, if, if you're not given any information whatsoever, that it may be a hazmat scene and you get there, and you make the wrong decision, I mean within a matter of seconds you could be dead.

Decisions about patient care were always difficult. There was increased difficulty in those scenes which resulted in many casualties as well. These larger scenes changed

the way patient care was delivered. Therefore, what would not be acceptable in a situation in which only one patient was involved became necessary when there were many. Jason a young EMT said it very poignantly:

And the more critical your patients are you really have to make that hard decision whether you have to pass that person up and go to the next person that's, that's more easily fixed, I guess. Because as your number of patients grow, your viable patients diminish, I think.

The core category of establishing and maintaining control is one of vast importance with respect to being aware of one's surroundings and in acting to control the components thereof. The category of establishing and maintaining control is comprised of the properties of the degree to which one establishes and maintains control of one's situational world, of accepting responsibility establishing priorities, coordinating the efforts of multiple agencies and persons and by decisions making.

Handling Information

Handling information was one of the most important functions of the rescuers. Handling information is defined as the sharing and collecting of timely information that is multi-sourced and relevant to the situation at hand. The major properties of the category include general information handling, initial information, receiving updates and communication.

General information. The use of general information had wide dimension. Information came from many sources including dispatchers, patients, fellow workers, bystanders and others. Information was both given and received. At times it was not that needed information was not available, it was that there was simply too much to deal with, indicating that the timing of information was important. Mark, commenting on the availability of information, said sometimes it was not the lack of, but the abundance of information that was the problem. He said, “But for the initial first responder, I mean the information you’ve got to take in and through the different media is just tremendous.” He went on to say, “you’ve got to get it everywhere.” Jane said this:

but it’s really difficult to balance three radios and a telephone and a dry erase board and the information that’s coming to you from everywhere.....So it was just a lot of information coming and we had to make those decisions very quickly.

Information was changing, conflicting, unclear or intentionally misleading. First-hand information was seen as very helpful and information received or reported could be about the scene or about patient care. It was also found, as one participant suggested, on truck placards suggesting that certain chemicals were potentially involved.

Information was not just received but was also provided and in some cases made critical differences in plans. Jack, speaking about a report of information he gave to his commanding officer, which in turn changed their plans said, “So, I immediately went

over to my captain and I told him, there's a man here saying that the occupants are still inside. And he told me at the time, well, ya'll get in there then."

Initial information. Virtually every participant discussed how the chain of events in a rescue began and it was typically by receiving the initial call. This usually came in by way of their dispatcher. Most of the participants mentioned "getting the call" or something very similar like, "the tones went off," or "the call came in." They remembered getting the call specifically and in some cases where they were. It was an important moment that seemed to set into motion the rush of a new challenge. Mark didn't say he got the call, rather he said, "I remember getting the call." He actually remembered receiving it. When these calls came in, it gave the responders their first glimpse into what they were about the encounter. Diane shared: we were dispatched to a multi-car MVA, um, out in the county. We were told possibly five to six patients. Um, initially. With one that uh, radio traffic said 1077, which means that they're deceased on scene already." This opening to her interview set the stage for dramatic events. Mike said that sometimes emergency calls did not come in like you expected them to and you simply come across the emergency event, like the one that occurred at the end of the driveway at his station. He referred to these as "still alarms."

Receiving updates. Another important property of this category is receiving updates. Many comments were made about the importance of receiving or the detriment of not, receiving updates. These updates were most commonly associated with radio updates provided to responders on the way to calls. However, some also were face to face reports from other on-scene providers such as fire fighters or police officers. These

updates allowed providers to feel that they were being kept in the loop in terms of the response effort.

Communicating. One of the most frequently cited and most important properties of this category of handling information was “communicating”. Because communicating provided critical information, how it was carried out was very important. When data were analyzed under the property of communicating, many codes and references to those codes emerged. This suggested its importance.

There were many dimensions of the property of communicating, including factors that inhibited and facilitated communication. In addition, there were the many types of communication used in all stages of the response effort. Finally, there were the people involved in the communication

The first facilitating or inhibiting factor was the proximity of the communicators to one another. Many participants mentioned being close enough to talk to, or yell at each other on a scene. The greater the separation, the greater was the difficulty in communicating. Responders preferred not to use radio communications except where absolutely necessary. Mike a fire captain described what he liked to do on scenes that were complicated enough to have several agencies involved. He said this:

...we use, in our response is what you won't find in the book but what I call the wagon wheel theory of you've got a hub of incident command, everybody else physically stands close enough to talk. Uh, in other words, if I'm the fire incident commander and we were on a multi-casualty scene, I want a representative from

the transport group standing within arm's reach or voice reach of where I'm standing. I want law enforcement standing within arm's reach or voice length of where we are. We're in a circle and we're talking.

This quote revealed the closeness in proximity that most preferred in conversing about scene management. It indicated that the main players involved were in close proximity to the incident commander; they were equal distance from him/her and no one was the priority, but all were important. It was the timing and the priority of the information that gave them audience with the commander and not their simple position. Likewise, the more separated rescuers were, the less effectively they were able to communicate.

Other factors that limited communication were, simply being too busy, the lack of infrastructure to provide common radio frequencies, heavily coded or encrypted messages and having to focus on too many different things at once. The timing of the communication was also critical and could be hindering. What may be important immediately to a dispatcher may not seem to be the priority to an on-scene responder trying to command the scene, direct personnel and even provide care. This frustration was clearly seen in the words of a well-seasoned fire captain who was getting so many requests from his dispatcher for updated information while trying to manage a complicated scene that it caused him to say, "I do recall a problem, you know at one point, wanting to just take the radio and just pitch it out the window." His link to the

outside world and the help that he needed had become a major frustration rather than a help.

Another major dimension of communication was the type of communication. Radio and face to face communications, hand signals and body language all were used. They all played an important role in communications.

The most frequently mentioned type of communication was radio communication. It was the primary means of communicating prior to scene arrival and in many cases afterwards. However, there were limitations. Radio signals were limited to “line of site” which means that obstructions such as mountains, trees and buildings reduced the effectiveness in areas where these were present. Frank said when he was responding to a shooting call, his entire fire engine crew only had one radio. This limited who could talk and to whom. How important Frank felt that radio was can be seen in his comment about it. He said it was, “our link back to help.”

Other limitations to radio communications included the fact that some responders were reluctant to say certain things over the radio. Mark said there was, “hesitancy to, to transmit all, information that you need to over a radio.” There was also the issue of overuse of the radio. This overuse meant people talking more than was necessary and therefore tying up air time. The radios were “half duplex” which meant that only one person could talk at a time. Bill, a physician who responds to scenes with the EMS responders he oversees said this about ineffective radio communications: “You know, uh, with the multiple, again, I’m scanning several frequencies at this point, the fire department and our frequency. You know, and sometimes volunteer fire department

people tend to scream in the radio.” Radio communications were sometimes intentionally limited. An example was the radio silence required to provide for safety when landing a helicopter.

Several factors improved radio communications. Using the radio to span distance was the most obvious of benefits. There were dedicated radio frequencies for use on the scene that were not used for dispatch. There were other dedicated radio channels such as ones for hospital or off-scene physician communication. More channels did not necessarily relate to all agencies being in the loop. Mike said this:

Um, from the fire service, one of the areas we talk about, and I know it’s a big buzz word in the response community today is interoperability. Uh, it actually goes a little deeper than the radio channels. Uh, we have a special channel that we use, depending – we got four different tactical channels in our organization that we use that we know what we’re gonna be on, uh, however, that doesn’t help us with law enforcement, or the transporting agency.

It was also mentioned by a fire captain that one could know that a scene was bad by the volume of radio communication. The implication was that when responders were busy, radio communication was reduced. Mark said, “if you’re sitting at a station whether it be EMS, fire, whatever, they get on a scene and you think it’s bad and you don’t hear a lot of radio traffic, most times it’s bad.”

A further dimension of the property of “communicating” was face to face communications. By far most providers preferred face to face communications to radio. The reasons included being able to be more free with the conversational language, being able to avoid special radio codes and being able to say as much or as little as one needed without tying up the radio. Some providers mentioned having to “yell” at each other from some distance as a means of verbal face to face communication. Eye contact and body language were also mentioned as being important to face to face communication. Being able to see and interpret body language was an important method of communication. Darrell had this to say on the issue:

I like the face-to-face only because again, you get to kind of almost see some body language of the person giving you the report. And you can maybe see that they're not in their normal stance, or maybe not as relaxed as you've seen them before, or they're out of breath. Because they had to run from where the patient was because they were so excited to tell you. Or, thought it was so urgent to run to you. Where on a radio you might not get that, ability to feel them and to sense that.....impending doom I guess.

He went on to say, “you can see when they're rattled.” Finally, another communication type was the recent use of cell phone pictures to convey the seriousness of the mechanism of injury to other providers including hospital staff and the use of runners in situations in which it was warranted.

On scene commanders had communicative interactions with other on-scene personnel, other commanders, dispatchers, bystanders, victims, law enforcement officers and others. Those involved with direct patient care communicated with hospital personnel and physician advisors. There were very critical communications between ground crews and air evacuation personnel.

Handling information included general information handling; initial information through the receipt of the call; receiving updates, typically but not exclusively received in route to an emergency; and communicating. Communicating included those issues which facilitated and inhibited communications, the modes of communications and the people involved in the communications.

Roles and Relationships

Roles and relationships as a category is defined as the roles played by various people both professional and non-professional, and the pre-existing relationships that impacted the development and use of SA on the scene of an MCI. The professional and team roles, the roles of those with whom rescuers interacted on the scene, and relationships with and among providers, constitute the properties of this category.

Professional and team roles. The professional role and the team role that rescuers played in an emergency response were primary drivers of the situational world over which responders attempted to gain control. Because these two roles mostly interacted with each other, they are viewed together. Professional roles included EMT, paramedic, nurse, fire fighter and physician. In addition to this professional role however, there was the role one played on one's particular team. A fire fighter/EMT may be the captain of

the crew and therefore may have responsibility for the IC role. A fire fighter/paramedic on the same crew may be assigned by the captain acting in the IC role, to do initial triage, report back and then begin caring for the most critically ill or injured patient. These two providers were a part of the same crew, but had entirely different situational worlds with which to be concerned. The professional role, along with the expected and perceived team role had an impact on what a provider needed to know and do on the scene of an emergency.

The following are some exemplars of this phenomenon. Kyle a flight nurse/paramedic, conveying his thoughts on his professional role and the roles of others, said this.

Inter-facility transports I think bring out more of the nurse in my training and background, where scene flights bring out more of the paramedic in my background. Uh, all of our flight nurses are required to be at least an EMT basic.....Uh, and that is so that the nurse who may have been trained for example in the CVICU for ten years would be a marvelous inter-facility cardiac transport nurse, but they may not have much background in pre-hospital medicine. And at least the training of an EMT basic gives them a perspective.

He went on to say:

I was trained paramedic first, nurse second. One of our other flight nurses was trained nurse first, paramedic second. She actually chose to go all the way through paramedic instead of stopping at EMT basic. And the perspective she keeps to me appears more that of a nurse. Where my perspective is almost still that of a paramedic with a transport agency with a nurse's training and education and widened background.

Dawn felt differently; she felt that being cross-trained as a nurse and paramedic allowed her to use both courses of education equally and that other than a few particular skills, nursing had just as much to offer as paramedicine to the patients routinely in her care as a flight nurse. She said this:

But I would say that the care that I provide and the particular situation of the patient would be for me just as equal nursing versus paramedic. Now there are certain skills obviously. Like intubation, um, that nurses don't frequently um, intervene in. So obviously, you'd have to think that's more along the line of a paramedic, EMS background. Um, but as far as basic resuscitation, as far as seeing that child in that particular situation, you know starting and IV, obvious, obvious apnea and pulselessness, CPR, common CPR. Um, you know, as a nurse I was certified in PALS way before EMS. Way before my paramedic days. Um, so you think about from that aspect, um, routine IV starting or interosseous starting, in starting, IV fluids, we're taught that in nursing. You know, so for me

personally from that perspective I would say that just as much of my nursing knowledge, training, and skill went into that as much as my EMS background.

Mike a fire captain/EMT discussed his own role transition in terms of his on-scene responsibilities. He said:

You know if you're a firefighter – and I love it – it was hard for me to go to driver/engineer because I wasn't going in the fire. And uh.... there's a hard part to saying my job is right here, I can't leave the truck. Those other guys are going in to fight the fire, and the same thing when you move from that to officer, when you from that up to officer, you're looking at, you're probably, you may be going in to fight the fire to help them, or to guide them, but still you've got more responsibility and you've got to continuously look broader and I think that's what uh, makes that work.

Professional and team roles varied by scene and depended on the demands of the scene. Ed, a volunteer fire fighter and EMT discussed using personnel in various ways. He said he was, “using that other firefighter even though he wasn't trained in the medical field to kind of corral the crowd and keep an eye on everybody until I had additional assets there especially the sheriff's department.” Roles and responsibilities depended on the type of professional, the expected team role and the requirements of the circumstances. These dynamic situations required flexibility.

Interaction roles. Other roles came into play in emergency situations. These roles were mostly non-professional. The media could not be considered non-professional and in some cases professional healthcare providers were bystanders. These additional roles included family members, the media, and bystanders and influenced the behavior of the responders in some ways, in some cases. The uncontrolled MCI scene allowed many to access the scene. This was a significant issue.

While most participants saw the media as mostly troublesome, at least one fire captain saw them as helpful in getting information out to the public. He saw the media as a resource in certain situations. In contrast, Dawn a flight nurse said she and other providers were “staying away from the television personnel.”

There were frequent and diverse references to bystanders on the scenes of emergencies. The characterization of bystanders varied widely from “the best help you’ll ever find” to “bothersome” to obstructionist. This was a particularly interesting finding because in no other type of healthcare, would completely untrained personnel be asked or even allowed to assist in any way with patient care. Jason told of a large event where he allowed bystanders to assist with accompanying patients to care areas. He said:

And the ones that were still there were the ones that were willing to help. And looking for, or, you know, wanting to help. And they asked, a couple of them actually asked if they could do anything. And I said yes, you can walk this patient to there.

In some cases, it was the spiritual care of patients that bystanders offered. Bill a physician, speaking about a catholic priest on the scene of a horrific MVA, seemed genuinely moved by a scene that he described to me. He said:

I remember this particular scene which was quite interesting; there was a Catholic priest who came up. And we, you know, he just kind of filtered through the crowd, uh, of, of people, 'cause again everyone was stopped. Their cars were stopped so they couldn't go anywhere, so a lot of people were wandering up to seewhat was the excitement. But this Catholic priest came and gave last rites to one of our patients who died on the scene. And I thought, you know, I didn't mind that. You know I don't know if she was Catholic, and, but, it.....it seemed like a nice...He was.....that was his role. Right there. You know. And he, you know, it was very interesting. And you could see the, people who saw this, the other bystanders, or even the rescuers, you know, really, that was just unusual for that to occur.

In some cases people milling around the scene were referred to as bystanders, but when the participants seemed more overwhelmed with the number of people around them, or felt obstructed in some way, they referred to the need for "crowd control." Bystanders also had an impact in another way. Rescuers were aware of the presence of bystanders, and their presence pressured emergency workers to act. This feeling was summed up well by Mark, a fire fighter who acknowledged the perception of bystanders.

...perception is there, perception from, from the bystanders, you know, why aren't you doing anything, as soon as you get off that truck, why are you not immediately running to that vehicle and being the hero?

He went on to say, "I mean, you, you've got to feel the pressure there."

Bill a physician went on to say that he felt that credentialing of bystanders who claimed to be healthcare providers was especially difficult because of the time constraints on an emergency scene. So, the roles of both professionals and non-professionals had an effect on an emergency scene and how professionals determined what was going on and what should be done.

Relationships with and among professional responders. In addition to the particular roles of those on the scene, the relationships that existed and were developed while running emergency calls together and while involved in training sessions influenced what happened on emergency calls. According to participants, knowing those with whom one responded either personally and/or professionally, improved inter-personal function and increased cooperation on emergency scenes. The primary ingredients were familiarity and trust.

Mike related the role he felt that personal and professional relationships had on the effectiveness of emergency response efforts.

Uh, we have found that the, the uh, ability to know who you're responding with it enhances, probably doubles, your effectiveness. One, you've already, you're starting out with a good working relationship. Uh, there's gonna be time, from time to time that we all have areas of responsibility that we're responsible for. From time to time we're gonna step on each other's toes. Uh, if you know who you're dealing with, it's not personal. You know that you're trying – everybody's trying to meet the same objective, nobody's in a turf battle. Uh, maybe if they step on my toes they're trying to get over there, we'll just all walk over there together. We'll make it work. Uh, that helps a lot if you know that. Uh, we have found that like each of our shifts we work 24 hour shifts. Uh, our transport group works 24 hour shifts.....Normally, I mean they will change around from time to time, but in general, uh, the same groups have their same days they're on, same off days, so when they come to work the same transport that was one last shift for them is the same one on this time, so they're used to, they pretty much know who they're gonna see if they're not displaced each time, and it builds that working relationship. And the same thing for the command level. Uh, from law enforcement to Ambulance Service A to transport to all of us work really close together, we work on emergency events, we work on non-emergency events, planning them, and all that gives us a pretty good feel of where we're gonna be and how we're gonna work together. I think it's one of the things - I think we've had some really successful scenes. And I think that contributes more to it than anything I know of.

Darrel discussed relationships making scene response smoother because of the understanding that partners had with each other. He called the unspoken cooperation between he and his partner a “choreographed play...or ..dance.” Jack a young fire fighter who fell down the stairs of a burning structure spoke of his partner waiting for him rather than getting himself to safety. He said:

It’s, I think it’s paramount to have some kind of relationship on the fire department with your co-workers. Because you know, we’re, you know, there’s a kind of like a brotherhood, you know, we – like he wouldn’t have waited at the top of the stairs at the house burning like that for anyone. You know, he cared about me and that’s why he stood there and waited.

Others mentioned that having a good relationship may bridge differences between workers and help to resolve conflicts that may occur with respect to scene management. A fire captain said that working on scenes and training younger fire fighters forced the development of trust. He said, “you train them to the best of their ability and you hope they can handle that situation.”

Not all roles and relationships were positive. Providing dimensional variation in the property of the category, one EMS worker told me that a particular transport service that they worked with was “not customer service oriented”, with the obvious implication

being that they could be difficult to work with. This could change how some emergency workers responded to them, decreasing efficiency.

The roles that each responder played and their function on their team had an impact on the scene. The roles of others on the scene also influenced the scene and potentially the actions of rescuers. The relationships built between different agencies and personnel for the most part improved response, but could be detrimental when dysfunctional. This category strongly impacted how the response effort unfolded.

Managing Resources

Another category of the theory that emerged was “managing resources.” This category is defined as the actions taken by responders to manage the resources of personnel equipment and time. The properties of managing resources are managing personnel, equipment and time. The many dimensions of these properties were the availability and sufficiency of resources, and the activities of assessing, obtaining, deploying, distributing, calling for, canceling, matching and assessing utilization of resources. The management of personnel and equipment was tightly intertwined; therefore they will be discussed together. Time management will be discussed separately.

Managing personnel and equipment. The resources brought to bear on an emergency situation were part of what must be managed if rescuers were to strike the right balance between resource needs and provision. The goal was to match the level of resource response to the needs of the situation. Often it was better to call for or simply allow additional resources to respond, if there was a question of whether or not they

would be needed. This was because rescuers could always cancel them later if they were not needed.

Before resources could be managed they had to be sent. Some responders felt that agencies always seemed overwhelmed. Mark, a fire fighter and captain of an engine company said:

I think everybody across the country or world or whatever will probably face this problem is from a standpoint that you never have enough people. You really don't, especially initially. Uh, you know, and that's understandable. You know cities can't, or municipalities can't afford, you know, to give you ten people on a fire truck. You know, that's just not common business sense.

Seth, speaking about an incident in which another air evacuation helicopter would have been useful said, "And you know, being in air medical service, just like, well, we can't get more aircraft just for this one event. 'Cause it's just not...money's not there." More resources may be desired or even needed, but that didn't mean they were necessarily available.

In some cases there were basic resources that were sent based on context, for example, a house fire or car accident. Mike, a fire fighter said this about the basic resources that were sent to a scene.

Well, it, we have an automatic number on, like we send on an initial call, say a wreck, a wreck with entrapment. Uh, obviously if we talk about a house fire we – most of our standard events we have an automatic number sent.

Echoing this dispatcher-driven resource application, John, an EMS provider responding to a shooting said:

.....with our communications center, all of our, all of the agencies, uh, here, the EMS, police, and fire are all in one room and we use the computer aided dispatch.....So, the, the call actually simultaneously goes out to, to uh, to the police and EMS at that time, at that time the fire department here locally did not respond to EMS calls.

Responders needed to assess requirements and utilization in order to match the resources to the scene that they were faced with. This was difficult because of the dynamic nature of these scenes. Mike said that it was important to match the command structure with the resources and with the tasks that the resources must achieve. But, he also mentioned the importance of staging resources to avoid duplication of tasks and lack of supervision. He said:

And they want to do something and if you don't give them a task they'll start a task and you will replicate and get, get, uh, task number three in front of task

number one, and then safety gets involved, and so you're actually being non-productive. It can get to a point to where you're non-productive.....One of the most crucial things I've seen on any scene is actually being able to match the command feature with the resources with the tasks that's got to be done, regardless of what type of medical call, or emergency it is.

Unlike Mark, Mike felt that you could have too many resources. In fact, using a humorous analogy, he said calling for more resources without clearly knowing what you are going to do with them is like "Custer calling for more Indians."

Being a leader could sometimes mean dedicating all of your time to insuring that those you were commanding had what they needed to provide hands-on care. In a rather large-scale event, Jane, one of the officers in charge made this point. She said:

But, one must lead the troops and sometimes you just have to bite the bullet and realize that the best thing you can do from your vantage point is to make sure that they have all the resources they need and that was my job.

Making decisions about the resources to be utilized could mean having to choose between some resources while eliminating the option of others. Seth, a flight nurse who anticipated possibly having to transport more than one patient, something they seldom did in a helicopter, had to choose to leave equipment behind that might be needed, in order to make carrying more than one patient possible. He went on to say that when they

arrived on the scene, the rescuers were, “so outnumbered that it was, I mean, it was almost to the point that you know, you had to laugh about it.” In fact he reported that they began transporting patients in the back of open trucks.

Manpower and supplies, including vehicles, heavy equipment and things such as medical supplies had to be managed. Sometimes the resources were well-matched to the needs of the providers on the scene. Sometimes resources were overabundant and other times they were grossly under-represented.

Manpower, equipment and supplies must be managed as part of overall resources utilization. However, time was also considered a highly valuable resource. The management of time sometimes impacted what and how other resources were utilized.

Managing time. Time was found to be a key factor in the minds of rescuers. This was primarily due to the fact that getting patients who were injured to definitive care in the shortest possible amount of time was critical. Responders were acutely aware of time during all aspects of response: from response time, to the times spent delivering care on the scene, to transport times. Kyle said that his unit had, “I would guess at less than 20 minutes from initial dispatch to at the patient’s side.” Mike discussed the issue of time globally, saying:

I guess what you base that on, what I based that on that day was knowing how many, uh, how many units I had pretty close by, I, in my mind quickly, very quickly, I built in a timeframe.....I’m thinking, I’m at point X now in time, I’m calling for these units, my transport should be arriving in X number of minutes,

my uh, vehicle, my unit's got the extrication tool should be arriving at X number of minutes. The best I can do is get two more units in X number of minutes. And maybe I will need some more, but, uh, you kinda develop a thing of calling for the resources and evaluating when I, when will I have my second report of progress.

Dawn a flight nurse discussing the time it was going to take to get two critically injured children to the hospital by air, compared it to ground transport, saying:

I would venture to say, considering the situation, that air transport in this particular situation was very appropriate. I remember we had a 7 to 8 minute ETA, to the hospital. And given the aircraft, um, that we flew in, um, approximate crew speed if you will, is 160 miles an hour. So roughly, it would have taken an ambulance, by ground, at least 16, 20 minutes or more.

As can be seen from Dawn's comments, decisions about where and by what means patients would be transported was another area in which time was frequently mentioned. With the increase in air-medical transport, providers were often faced with a vast array of considerations, not only the criticality of the patient, in determining whether ground or air transportation was most expeditious. Besides whether the patient was critical enough to justify its use, the decision of whether or not to use air transportation almost always had to do with the amount of time it would take to accomplish getting the helicopter there, locating a safe landing zone, loading the patient, getting them to the

landing zone and loading the patient in the helicopter. Mark, discussing this very issue said this:

...with Medical Helicopter is yes, it's a good asset for out in the county so to speak, but, traveling distance from City A to Hospital B is really not that bad. Uh, you know, it's kind of iffy call in that a lot of cases it may take just as long, if not longer, by the time you get Medical Helicopter en route, having to clear traffic, land them, so on and so forth...

In some cases the time that rescuers had taken providing care for patients was also a consideration, as seen here in the words of Dawn, a flight nurse:

They continued resuscitation efforts um, they used a Brazlow just as we had used to verify all of our care and the equipment that we were using, the drug dosages, um, they continued resuscitation on that baby for probably another ten minutes. Um, or so, because actively in the field we had been resuscitating for probably fifteen minutes total.

In one event that occurred, there was a large gathering of people for an air show. Emergency responders did not expect any weather problems. When they found out that a severe thunderstorm capable of producing a microburst and strong winds was coming,

they were taken by surprise and time became a major issue. Jane, an EMS supervisor said, “we got 12 minutes.”

The management of resources, including human resources, equipment and time proved to be an important category. Deciding what resources were needed and matching them to the context of the scene, were important functions of EMS providers. A mismatch could produce insufficient resources to efficiently perform the rescue operations or produce duplication of services and lack of supervision. Managing time impacted arrival at the scene, on-scene time, time to provide treatment and affected decisions of transport.

The Human Element

Emergency responders are human beings and as such have emotional reactions that impact them personally and potentially, the job they do. The definition of the human element category is the range of emotions experienced by providers in response to emergency situations and their methods of managing the emotions. These two major components of the definition became the properties of the category.

Emotions experienced and impact. Responders experienced emotion when faced with the stress of acting under pressure and the human suffering that often occurred during emergency events. In some cases they described simply and plainly that they had experienced a particular emotion. In other cases it was my judgment during analysis that an emotion had been experienced, based on what the provider said and how they said it. The difficulty faced in discussing this category is capturing completely in written form, the emotions that these providers conveyed. Many of the emotional responses expressed,

were conveyed by many of the providers, thus allowing the communication of the emotions of many, through exemplars.

First, there was the basic desire, or longing to help; to know what to do in an emergency situation. While some providers, especially the more experienced ones, wanted to be able to control the scene, the driving force behind the desire to do that was the desire to help those who were injured. Examples of what both experienced and relatively inexperienced providers said are presented. First Jason, a young responder with a limited amount of experience said this:

Because you see a wreck and you see a bunch of people standing around going oh my gosh, is he hurt? Well, go see if he's hurt! Go see if you can do something. You know, it just seemed common sense to me to try to help. So, I wanted to do something.

More experienced providers seemed to deal with the emotion of having to let go of patient care and perform more administrative and oversight functions, that they saw as less directly involved in actual care. These responders would say, as Jane did, "it required some restraint to stand up on top of that hill and direct the troops and not get personally involved." She was indeed very personally involved, yet felt less so, because of the lack of patient care duties. She went on to say, "you have to step above that", because she was "dealing with bigger issues."

Mark, describing a similar struggle where he was responsible for the overall scene, but found himself needing and wanting to provide direct care said, “it’s just human nature, the closer you get to that fire, the more you become, have tunnel vision on that fire and that fire only; just like I had tunnel vision on that patient and that patient only”. Yet justifying what he was doing, he went on to say, “I needed to be in there, hands on.” The need to do something and seeing himself as having too few caregivers, at least at the moment, caused him to make the decision to provide care. Right or wrong, this decision could affect the development and maintenance of SA.

Responders also felt emotions of different types during calls. These emotions included frustration, shock, empathy and emotional pain. Dawn, a flight nurse caring for two critically injured toddlers, spoke of her feelings as she saw the parents of the injured toddlers watching as they wheeled one of them, pulseless and apneic, into the emergency department:

The parents were there. I remember um, thinking how did they get there so quick, but they did. And Mom was there and I remember thinking how awful that was to have to roll that baby by her and her see me doing compressions and bagging that baby.

Darrell described the emotion of having cared for a fellow emergency responder who was killed while responding to a call saying, “that really bothered us.” He also said the call was, “very emotional for us.” Seth was on a scene where he was attempting to get

the accurate history of an event that led to many critically ill young people. He felt that friends of the victims were being intentionally obstructionist, because of fear of prosecution or otherwise getting into trouble. He described his feelings as, “Just pure anger. Just distracting. Um, and I knew when I got to a certain point, I’m like, you know, this is bad ‘cause I feel this way.”

Others conveyed a feeling of anxiety based on the pressure that they felt to respond immediately, and to respond appropriately. Mark expressing empathy because the IC is under pressure said, “I think initially when you first get there, you know, you always feel sorry for the initial IC because he’s got anything and everything to do right there.”

John, an EMS provider conveyed the pressure he felt to provide rapid effective care to a gunshot wound victim:

He was still awake, he was still talking. But, you know, just knowing that he’s got, he’s got that bullet in his chest, you know, that you know, we, even though we’re moving as quick as we can in my mind we wasn’t moving quick enough.

Because the guy had a bullet in his chest.

It was clear that these two providers perceived the pressure and felt the anxiety imposed by the responsibility to properly perform their jobs in a timely and effective manner.

Managing emotions. While these providers admitted to feeling emotions and pressures, a very frequent and well-described dimension of this property of managing

emotions was the need to compartmentalize the emotions as much as possible during the actual response, in an apparent attempt to mitigate the impact of emotions on their performance. Several providers described the emotional detachment necessary, as action that they needed to take. They said they had to, “try to block it out”, that they, “clicked into a mode”, and that they “just kind of flip a switch.” Mark, commenting on why this compartmentalization was necessary said, “the closer you become to the actual scene (emotionally), the less you are in charge of the overall scene.” Dawn made this very clear by saying, “my philosophy is you cry about it after the call.”

Having at least attempted to compartmentalize the emotions during the call, participants suggested that it was best dealt with after the call in some specific ways. Darrell, discussing the difference in what he felt worked and what did not in terms of mitigating the emotional impact said:

We all have the raw emotions. And we see this stuff every day, and you have to learn how to deal with it. ‘Cause it will hurt you. I mean EMS and fire of course have the highest suicide rates and the highest drinking rates, the highest divorce rates. So you have to learn how to deal with it. And you know, sometimes ours is adrenaline pumped stuff....You know, exercise and there’s a lot of people who drink and a lot of people who drink a lot. And I just have never found that to work.

Dawn captured the feelings of the after-call emotions; where the provider had time to sit and contemplate on what had just happened.

I remember being tearful afterwards and thinking – that’s awful! You know, I remember thinking, not so much from a judgmental perspective, but I remember thinking could I ever, could I forget my child in a car? You know? Could I do that? And like I said, not from a judgmental perspective....but I thought, from a medical perspective, what that baby, what both babies, but particularly that female child, 17 month old, what she went through to the point of what she was. You know. That the exhaustion, the suffocation from the heat in the vehicle.....And you know, you can’t help but think about that.

Similar to Darrell’s comments, she went on to describe how those emotions are dealt with, when she said:

....there’s positive ways to deal with and there’s negative ways to deal with it. And unfortunately, some of my colleagues deal with it a little bit more negatively than others. You know, some of them go and drown themselves in alcohol after a shift. And of course that’s a negative way to deal with it. Um, others will go and work out in the gym for a couple hours to release their emotions. And it just, what works for you...

Many providers discussed being offered professional ways of dealing with their emotions such as help lines and professional critical incident debriefing. These responders conveyed that they experienced a range of emotions during and after calls. The majority mentioned that management of those emotions during the call meant deferring their dealing with and in some cases even experiencing those feelings personally, until after the call.

Insuring Safety

The definition of this category is the safety priorities that rescuers set, the threats faced by those on the scene and the actions taken to protect the safety of those on the scene. Properties of this category were the goal and priority of insuring safety, threats to safety, and actions taken to insure safety. In all types of healthcare one might presume that providing patient care is the most important aspect of what providers do. However, responders felt that insuring the safety of all those involved in a rescue effort was the most important aspect of a response.

Goal and priority of safety. Responders felt that the goal of insuring safety was very important. It meant going in with the attitude of making sure the scene, the responders, the bystanders and the patients were as safe as they could be. Stan a young EMS provider said that scene safety started with dispatched information. He said:

..it starts off with dispatch. You know, depending on what the call is, you know, dispatch may say there's a shooting in progress. Well, obviously the scene's not

safe. They would then not even enter that scene until the policing agencies had insured its safety.

Once at the scene, Mike said that a priority was “to look at first of all your safety for your responders, uh, and for the general public.” Diane, an EMS provider went further and said, “scene safety is the first priority for anything. Um, it doesn’t matter if you’re responding to a medical call with one patient or a mass casualty incident with fifty patients. Scene safety is the first priority.” She left no doubt that it was the most important factor.

Mark said that meeting the goal of safety was even more challenging when there were young responders who were anxious to prove themselves.

...that’s the tough part for an IC, is not being too quick. You know, you ain’t gotta worry about the quick part, because you know, and I’m sure our department’s like most other departments, all I gotta do is turn around and I’ve got two firefighters back here that are adrenalin junkies.

Ed said the goal was “to make sure everybody’s going home at the end of the night.”

Frank reiterating this goal said, “Uh, very first thing we’re gonna do is we’re gonna make sure that the people are gonna be safe, whether it’s blocking the road with a truck, or you just assessing what’s going on around.”

Some rescuers also prioritized the safety of those on the scene. Some, such as Diane, were very pointed about the priority of safety for all and for rescuers. She said:

First of all you look up, you look around, you make sure your scene is safe, first for you, then your partner, then any by – then any other responders, then any bystanders and the patient last. A lot of people say, well, why the patient last? Well, because you’ve already got, that’s already a patient. You have to make sure that you’re not gonna end up with more patients because the scenes not safe.

Threats to safety. Rescuers faced many risks. Participants reported fires from damaged vehicles and structures, downed power lines, risk of violence for a variety of reasons, traffic hazards (one participant had actually been struck by a passing car before), the risks inherent to air evacuation, chemical exposures and others. These were the more traditional risks for which the rescuers had trained. Flight crews had an increased sensitivity to the risks involved. Flying, many times at night and landing in and taking off from hastily formed landing zones was very risky.

An NBC news report on February 23, 2009, suggested that the number of medical flight services has exploded to over 700 nation-wide (Epstein, 2009). In 2008 alone, there were 13 crashes of medical helicopters, resulting in the deaths of 85 people, making medical flight the most dangerous type of aviation in the country. The risks may be settling in to the psyche of flight crews as the words of Seth, a flight nurse showed. After hearing about needing to provide safety and good patient care on scenes from several

other participants, I theoretically asked him about the balance between the two. He pointedly said:

..there is no balance. The whole, my whole thing is that I'm gonna take care of myself, I gotta get there safely. If we crash, if we become incapacitated from that, then we've created yet another, you know, another whole scene that's gonna be bad.

Unspoken, is the fact that he is accepting a level of risk to go to the scene and help a patient in need. Participants were willing to accept some level of risk to provide care to those in need. Kyle another flight nurse discussed how the crew; a pilot, a nurse and a paramedic determined whether they accepted a mission. They all considered the situation including the weather and then voted on it. While all three had to agree to go, the dissent of only one crew member could scrub a mission. He said it this way; "three to go, one to say no." Jack a young fire fighter, when faced with entering a fully engulfed structure fire, struck the balance between care and safety when he said:

How much risk can we incur on ourselves for what outcome? You know, are we gonna risk ourselves just for, you know, nothing. And just try to put a house out that's already completely lost? Or are we gonna risk a lot to save three or four people? When we heard the man say that the whole family was in the house.....we decided that was enough to risk a lot for.

Participants also spoke of some of the newer threats to the safety of all of those on the scene. Many providers saw themselves at risk because of a perceived societal penchant for violence; even violence against rescuers. Frank an EMS worker simply said, “I think people are more ready to use, uh, physical force than they would in the past.” He went on to say, “the times are not the same.” Other responders echoed this feeling, with John saying, “it’s a different world today.” John went on to suggest that even training has changed dramatically in response to evolving safety issues in the field.

Uh, it’s actually, it’s actually taught when, when, when folks go through their paramedic training now, one of the – the first things they’re taught is when they arrive on the scene is to evaluate the scene and they want to know if the scene is safe or not. When I took my paramedic training over 25 years ago, it, they didn’t teach that. They taught that you just went in and you got your patient and if it was an unsafe scene you got out of there.

Other more recent problems were the threats posed by newer hybrid vehicles. When the fire department has to cut into a vehicle, cars that use electricity for propulsion pose increased risks for electrical shock during extrication procedures. As Mike stated, because hybrid vehicles are electrically powered, “that patient can move one foot, accidentally hit the gas and run over you or other responders because there’s no engine to make a sound.”

Another sign of the times was a comment by Seth a flight nurse who responded to a scene where there were multiple unconscious people at a party. While considering all of the possibilities, he knew that if for example, someone had been manufacturing methamphetamine, it would impact his ability to transport. He stated that it was actually against FAA rules for him to transport, saying:

It happens, um, the meth, uh, this meth craze that's going around has really, I can think of three cases this summer alone in which we responded and they said yeah, they're burned, it's a meth lab explosion. Have you decontaminated them? We've got them wrapped up. That's not good enough. Have you done the steps, has somebody that's certified to do it done it. We don't have anybody certified to do it. We can't put them in our aircraft.

These new threats to safety have had an impact on what crews understood about their own risks, about the decisions that they made and how they protected themselves.

Actions taken to provide safety. Taking action to protect those on the scene, meant being cognizant of the risks posed by a particular incident and taking action to minimize those risks. Responders suggested that how their vehicles were parked in a way that blocked traffic, looking for downed power lines, fire hazards, placards on vehicles involved, traffic directing, the wearing of reflective vests and personal protective equipment, were all actions taken to make the scene safe.

One of the first actions for protection was inaction. Mark said it was important that they “don’t rush in” and that what was also important was “not being too quick.” He went on to say that sometimes you had to refer to professionals outside of the medical field, saying, “Well, we’re not electricians. I don’t know if there’s any power in that or not, so, now you’re talking about a response from a, from the utility company to make sure the power’s off.” Mike, a fire captain said what makes the scene safe in some instances is, “stopping any further damage.” He related the story of a bus that ran over and was sitting on top of a car with the wheels still turning even though the driver was out of the bus.

..so our first task in everything that was going on, was to go inside the bus uh, pull on the air brake and get the engine shut down. To stop, to stop any further damage of, keep it from coming on into the car where the seriously injured patients were. Uh, at that time we were able to do that, uh, the patients were entrapped in the car.

A flight nurse, responding to a scene of unknown mechanism of injury mentioned that in terms of landing zone safety, how they approached the scene and where they landed was important “so we’d be landing upwind.” The safety of a landing zone was extensively spoken about by every air medical flight responder. It was important enough that ground crews assigned the locating and securing of a landing zone to an “LZ commander.”

Sometimes the action to ensure safety was communication with other responders, such as policing agencies. John responded to a courthouse shooting in which a man killed or critically injured several members of his family. He received safety information from a police officer he knew who told him, “we have the dad in custody.”

Adherence to policy also provided safety. This was the case with Jack, who related his department’s policy concerning entering a burning building, “Like you have a two in, two out policy...If you don’t have a partner to go in with you just don’t go in.”

Participants wanted to provide excellent patient care, but they recognized the need to do that without creating new victims; themselves and bystanders. So then, safety is the priority and the patient care can only be undertaken if it can be accomplished with a reasonable risk to benefit ratio. Safety becomes a condition which must exist at least relatively, before patient care can be provided.

Patient Care

Patient care was an important part of the stories the participants told. Patient care was defined as the actions taken by responders to triage, care and dispose of patients. This category resulted in the desired consequences (along with safety) of the response. The primary properties of patient care were the triaging, caring and the disposition of patients.

Triage. Triage revealed itself as an early property of patient care. However, the order in which patients received care and the amount of care received was at least potentially altered in multi-casualty scenes. “Triage” was not even necessary where only one patient needed care. Even on MCIs, where there were sufficient care providers and

few patients, care was provided very similarly to situations in which there was but one patient. However, triaging or sorting patients based on survivability and resource utilization was very frequently mentioned by participants. They reported that the mere fact that an incident was an MCI, automatically altered how patients were assessed and treated. This change in procedure was difficult for providers who were infrequently impacted by its constraints. Diane, an EMS provider who is also a nurse explained it this way:

....if you only have one, we'll say two patients total. Um, you typically can focus all of your energy and, and, um, attention to those one to two patients. However, if you have more than two patients, we'll say seven at this point, using this example. You have to look at them, for example we do a start triage, simple triage and rapid transport. You go up to a patient who's obviously unresponsive; they don't have their eyes open. You do the basic hey, hey, you okay? If they don't respond you look, listen, feel. If they're breathing, open the airway, if they're not breathing, but you've got five or six other patients you know about, and you've already done the manual jaw thrust to open the airway and they're still not spontaneously breathing, you have to stop what you're doing with them and move on to the next one.

Mark said this change was necessary so that "you save the ones you can." In contrast, a single pulseless, apneic patient, being cared for in a situation where the

resources were not overwhelmed or even potentially overwhelmed, would receive the full attention of providers. However, in MCI the amount of care that one may receive was clearly, in some ways, rationed. John suggested that a provider in this situation cannot linger and provide definitive care saying; “You’ve got to move on.” To establish what should be done and for whom, it was important to know the number and acuity of the patients. Ed said, “I tried to assess number of patients and priorities as soon as possible.”

Rescuers also suggested that when there were multiple patients involved, it was important to reassess patients frequently. Diane said that initial triage was certainly not the end of assessment.

And we did that you know, we went back several times and re-checked the patients. Okay, has anything changed on your patient? No, you’re still good, nothing’s changed, that bleed is controlled, okay, good. And move on to the next one and re-check them. And that’s how you do triage.

Therefore, the care that the patient received was decided in brief moments of time, based on specific triage criteria.

Caring. Caring as a specific property of patient care had many dimensions. The first was utilizing the mechanism of injury in determining patient condition. This was separate from triage. Most participants mentioned using an assessment of the mechanism of injury as an indication of how and to what extent the patient was potentially injured.

Ed provided an explanation of a basic assessment of mechanism of injury for an MVA saying:

Typically to identify the mechanism of injury takes about all of fifteen seconds. You can just walk around, do a visual inspection of the vehicle, uh, look at the body panels of the vehicle and determine whether there was significant protrusion, penetration into the passenger compartment which is a big cause of penetrating injuries, um, whether the airbags were deployed, uh, what the front end of the car looked like, was the roof crushed, were the seatbelts being worn or were they frayed, or were they just not being used at all.

John, responding to a shooting, found out that there might be multiple mechanisms. The scene to which he responded involved a shooting in which three people were shot outside of a courthouse. Another man had sustained a broken ankle jumping off of an elevated platform in an attempt to avoid the shooter.

Diane, suggested that the patient may need to be treated and transported based solely on the mechanism of injury, despite lacking obvious injury or pain. She said:

Due to the mechanism of injury, we convinced him to go ahead and get transported to seek treatment, make sure he was okay, with the adrenalin and everything going it was very, good possibility that he couldn't feel his injuries at the time. But he had struck vehicles head-on.

Mike added, “Once we’re normally arriving the, the big thing is looking at that mechanism of injury.” This was important to responders as a first step in providing care.

Assessment of the mechanism of injury was where care began. Patient care was a very important part of what these responders were doing. However, certain conditions had to exist for the care to take place (see the category of Safety). Assessing the mechanism of injury led to anticipating what might be wrong with the patient so that care could begin.

Participants described caring for victims in several ways. Since these situations occurred in uncontrolled settings outside of a healthcare facility, in some instances patients initially had to be located. Multiple participants mentioned having to find patients. One participant was involved in a large outdoor event where large tents collapsed creating debris that had to be searched through. Another mentioned searching for victims in a burning structure fire. Another participant told of victims involved in an MVA that were hiding in the woods for fear of facing the legal consequences of the accident.

Providing direct care to patients was very important to participants. One participant said, “the care was my primary concern.” Another said, “patient care is always a priority.” This last statement also was important concerning responder priorities. Care was *a* priority, not necessarily *the* priority. While locating patients was sometimes difficult, even when located, access was sometimes limited. Some patients had to be extricated from crumpled vehicles before advanced care could be delivered.

Actual medical and nursing care provided was thoroughly described by many participants. Patients were assessed beyond simple triage and treated for their injuries. Some of the descriptions were very dramatic. Dawn discussing her treatment of two toddlers with severe heat related injuries said,

...my partner and I went right to work. As you do often times in that situation not thinking about actually what you're doing. But we quickly obtained an airway on the female. Um, I did a quick evaluation. She was apneic. There was no pulse rate palpable and no audible um, heartbeat. Um, her extremities in quick evaluation were already stiffening if you will. Her eyes were, pupils were fixed and dilated. They were already glazed. Of course I'm looking at all of this and examining this as I'm getting my equipment ready.

Others discussed scenes far less dramatic. Jason tells of treating a simple scalp laceration among many patients who required treatment. He said,

".. the gentleman and he had a very large triangular shaped laceration on the back right side of his head, from just above his ear down to the base of his neck. So, we got as much gauze as we couldand ...held that in place."

Not just the physical care was mentioned. Frank, in the middle of caring for multiple shooting victims felt it was important to acknowledge family members' losses. He said,

You know, but just our general approach to them and trying to talk with them and you know, be reassuring that we're gonna, we're doing everything for them. You know, you know, what can you say to them? You know, 'cause they'll, you know, 'cause they'll ask you, you know, they'll say what, I know she didn't survive, you know, No sir, she didn't. I'm sorry. She didn't make it.....I mean, you know, they knew it. And uh, that's hard to do sometimes because you know sometimes people need to hear that.....You know, you have to obviously be a little bit empathetic with them.

Providing patient care also required other considerations. Care of patients many times had to be released or transferred from one provider to another, either because of transport necessity, or because an arriving responder was more highly trained, and therefore the most qualified to provide the care. Some fire services had paramedics who responded, even though the department didn't have transport capability. This required coordination of care. Mark related the particulars of this type of situation, saying:

Ambulance Service A may not necessarily agree that we need Medical Helicopter. So, certainly, which is within their right, which, again, creates another problem,

uh, because if you go back and you look at protocol so on and so forth, the initial paramedic on scene is actually in charge of the patient until he releases that care. So, you know, actually he's got a, if he doesn't ride in...

Jason mentioned allowing more qualified personnel to take over. He related the following story:

I guess, the protocol, I'm not sure if it's even written or not, but when some of the higher rank shows up there and it's your patient, you have the option to give that patient to the higher rank. And all the Medical Helicopter people are paramedics, so, when the paramedics, the Medical Helicopter people showed up, I didn't really have a problem with kind of stepping out of their way, 'cause they had more of the equipment and, to me it was more foolish to be the one that wanted to be "the patient care provider" and I didn't have all the equipment and I'd have to keep going to them to get the equipment. It made more sense to let them step right in front of me...

Further clarifying this issue was Stan, who is a basic EMT. He relates:

Um, usually we just, you know, we take, we split up. And you know, if I have the worse patient of the two, or have however many, he'll usually go with them and I'll go to the less injured patient. 'Cause he has the higher level of care.....He's a

paramedic and I'm an EMT basic. He has, you know, advanced life support capabilities, where mine are basic.

Another dimension of the property of caring also included seeking advice from facility-based medical and nursing personnel. Many times responders would chose or were required to contact a facility for orders and to report on the patient's condition.

A unique dimensional variation of the property of caring, is the act of discontinuing care. When multiple patients were involved, not only did triage change, but in one case, care was discontinued. Bill, a physician, responded to a MVA where a relatively large number of patients were injured, some critically. Since the manpower was stretched thin by the demands of the scene, Bill, and another physician who stopped to help, actually discontinued care that had been initiated. He told the story this way:

Well, the worst one was that particular patient there who had an open skull fracture with brain, obvious brain injury, but was still, was unresponsive, but was still breathing. And had a slow heart rate when we finally got her extricated and so we, you know, intubated her and tried to, you know, but, you know, she continued to deteriorate even though, after the airway was established. And we, you know, the other doctor and I, just, decided not to do CPR.

Patient care was a very important part of what responders did on MCI. The care that was provided affected what rescuers planned for. Patients were triaged and cared for

by means of assessing mechanism of injury, providing medical and nursing care and utilizing the most highly trained personnel possible. In some rare cases where resources were overwhelmed and for the good of all involved, discontinuation of care took place. However, patient care was not complete until victims were disposed to facilities that provided definitive care.

Disposition. Patient disposition was another described property of the overall category of patient care. Disposition included deciding by what means patients were transported and to what facility. Important factors were the proximity of the hospital and the capability of the facility.

Early on in the situation, it was important for the responder to begin considering what transport modalities and facilities might be required. Frank discussed this issue and said:

...you gotta start noticing location of your local hospitals. Because, if.....you've got more than one hospital can handle, then you gotta start talking about notifying other hospitals.

In some cases, there were sufficient numbers of patients involved so that a transport area was established. Jason discussed this issue, saying:

Right about then the emergency responders.....decided to set up a transport area which was behind us and to the right. So it was closer to the emergency response

vehicles. We then moved our patients that could, well, all the patients at that point, we moved them all down to the transport area and we had started setting up....And that was our central location for the transport area.

Transport time to the facility was also an issue. Mark spoke about consideration of transport time and said:

Especially in given in that, in that where we're located. Now obviously if, if we're out here in City T, that may be a different case because it is, it does take longer to, not only for Ambulance Service A to get there, and when I say Ambulance Service A, any ambulance to get to our location here, but it's gonna be longer getting them back into the hospital.

The question of transport time along with patient acuity, also led to many responders to choose the use of air medical services, assuming they were available. Many factors had to be taken into consideration including the availability of a suitable location to land the helicopter, the freeing of manpower to prepare the landing zone and man it, as well as the dispatch and response times of the helicopter. Several providers said that it was at times a very difficult decision, especially if ground transport was not lengthy. Mark spoke to this issue and said:

Trying to make a decision and decide, you know, which is gonna be the faster route, uh, I think in the end, what wound up making the difference in that was traffic was backed up that we would have had to land Medical Helicopter far away anyway, that we would have had to load them in an ambulance and carry them to it, to the helicopter anyway, which would have been a delay.

It wasn't just the receiving facility location that was important. It was also important to match patient acuity to the capabilities of the facility. Patients who were not critically injured could request a certain hospital, even if it was not the closest facility. However, according to John, an EMS provider who was dealing with a multiple shooting situation, critical patients required transport to the closest, capable hospital.

....the one in his chest, obviously went to the closest and the level one trauma center. You know, the other two, could have if they would have requested, to go to another hospital. They could have. But those two, we didn't ask the guy with the bullet in his chest which one he wanted to go to because we could almost see it from where we were.

Even the helicopter personnel had to decide which facility may be most appropriate. Kyle, a flight nurse made this statement, "and we were in the situation where we were just less than five minutes difference to the two but we were closer to what we'd consider our base hospital. So we transported there." In one case in which many people

were injured in a single vehicle MVA roll-over, those involved were from out of state and were transported to a hospital with very minor injuries, because as Bill said,

And they didn't have any family here. Again, they were from State A, or something like that. And so, and the mechanism of injuries. So it's like everybody is going even if you just have a scrape, you know, just because, well, that's the only place to go!

In terms of patient care, the properties were triaging, caring and patient disposition. Triage assisted personnel in determining what kind and how much care would be needed. Caring took on many forms from assessing the mechanism of injury and the patient, to providing direct physical treatment and in some cases psychological comfort. Disposing of patients required responders to begin assessing early what modes of transportation and which facilities might be needed, as well as properly matching patients to transport and facility types based on time and resources available.

Categorical Relationships

In grounded theory it is important to describe the relationships that exist between categories. This step is what makes grounded theory what it is. The relationships that emerged are presented here.

The core category was establishing and maintaining control. This category was the anchor that held the other activities in place. Whether the purpose of a responder was to provide incident command or to care for the most critically injured or ill patient, there

was the need to establish some control over the scene, maintain that control and thus meet responsibilities by managing the other categories involved. Based on its position in the theory, establishing and maintaining control indirectly connected all of the other categories in the theory.

Participants were attempting to establish control over their own situational world. In the theory schema, establishing and maintaining control occupies a central location. This is because participants revealed that even though the ultimate goals were to establish a relatively safe environment in which to provide patient care, this goal could not be achieved until they had established priorities, coordinated efforts and made decisions, which are the primary properties of establishing and maintaining control.

The following statement by Jane reveals the relationship between the category of handling information, of which communication was an integral property and the category of establishing and maintaining control, of which decision-making was an integral property.

..it's really difficult to balance three radios and a telephone and a dry erase board and the information that's coming to you from everywhere.....So it was just a lot of information coming and we had to make those decisions very quickly.

Decisions made and the actions taken, then feed back into the pool of information of which one must be aware. The following example from a scene where Mark was the IC shows the centrality of this category. He discussed requesting additional resources,

because his own crew's role was not transporting patients, but that was someone else's role. In addition, he had to establish priorities, coordinate with multiple agencies while handling information through communicating with dispatch and the additional resources. And all of this was done to provide safe patient care. He said:

There, there, there are certain, there's more coordination if nothing else that's got to be considered. Uh, for example, uh, you know I mentioned the fact of multiple units that we had to request. Uh, if we would have been transporting on our own, would, would have been a lot easier process just from the simple fact I get on my radio and call the station. Call one of the other stations. You know, bring me another ambulance.

None of the functions of control can be accomplished without communications, one of the major properties comprising the category of handling information. Communication is necessary for managing resources, another category. Darrel spoke of getting to the scene and realizing he needed another paramedic unit. He said: "We did that once we got there and saw that we had two, true priority ones, or you know, life threatening patients, we called for a second unit, and one was already being dispatched." This exemplar reveals that he was making decisions which established control. He was also managing resources and communication was required to do that. Managing resources feeds back into establishing and maintaining control as well when responders arrive, begin performing their functions and report back.

Experience as a background, affected every category and in turn was altered by each one. In filling the background, all decisions made and actions taken on a scene were impacted by a participant's response history. In addition, the interval actions, which included education, training, drills, self-critiques and others, added to experience but less so than actual responses. However, the interval actions and the emergency response experience of the individual came together to make up a matrix against which the rescuer responded and acted. In turn, the scene itself added to the experiential level of the responder and subsequently contributed to decisions about what occurred in the interval action.

The core category of establishing and maintaining control was impacted by experience in that having experience allowed one to have what Mike described as “a multi-dimensional view.” This view was something that he suggested was only developed through much experience. From handling information to managing resources, to recognizing the roles each responder played and the relationships that existed among the responding personnel, experience changed how one reacted. Sometimes experience affected more than one other category at a time. Mark discussed how experience in handling information through communication, increased the ability to appreciate context and complexity. He said, “I have experienced, uh, you know when you get on a scene and you don't hear a lot of radio traffic, you know something's going on, because people are busy.” Someone with little experience may interpret the lack of radio communications differently. Experience, or the lack thereof, had a impact on how the process of SA developed.

Experience made a difference in terms of creating a safe environment (safety). Inexperience could create a situation where younger, less experienced responders might be somewhat hasty in acting, even to their own peril. Mark said it was important that he take responsibility for the less-experienced responders, which he referred to as “adrenalin junkies”, by making sure that they “don’t rush into anything.” Experience seemed to create a more thoughtful, sober-minded approach to safety.

Lastly, experience had an impact on the care that was provided. Bill, an emergency responder and physician explained how experience could come into play in patient care:

..what’s the best way, quickest way, without, you know, jostling the patient too much. And so experience has a great deal to do with that. And also knowing what to anticipate. You know, I see this particular injury, or something, um, I may be looking for a potential complication as opposed to I’ve, you know, I’m inexperienced, I’m, you know, I see a, you know, a, a head injury, but I didn’t think about the neck too.

Experience had an impact on the entire process of situational awareness. It provided the condition of preparedness of the responders to the incident. It changed the way participants generally reacted to it. Jack, when asked about how the level of experience of the responder impacts the scene, said:

I think it's one of the biggest aspects of it all. I think that once you've experienced certain things and have seen things with your own eyes, and know that may be the same as what you read in the book, or it may differ. I think it'll certainly, um, change the way you think and react to situations.

Against the background of the provider's knowledge and experiential mix, participants respond to contextually-based incidents. Responders had to begin to appreciate what type of event they were dealing with and how they would respond. This created a direct and linear relationship from the category of interval action to appreciating context and complexity and on to establishing and maintaining control.

Responders used properties of appreciating context and complexity to make sense out of what was happening on the scene. This not only occurred through the senses of the responders when they arrived at the scene, but also before they arrived in the form of dispatch and other radio information. This relationship demonstrated the category of handling information having a relationship with establishing and maintaining control, but also an additional diagrammatically depicted relationship with appreciating context and complexity.

After responders have appreciated, or are at least in the process of appreciating the scene that they are responsible for, they begin to establish priorities, coordinate efforts and make decisions, which are the primary properties of establishing and maintaining control (the core category). Therefore a clear relationship exists between the

categories of establishing and maintaining control and appreciating context and complexity.

The core category also influentially reciprocates with the category of roles and relationships. The controller must know what roles other providers play in terms of professional discipline and their particular function on their team. Participants feel that the relationships, both personal and professional, strongly affect rescue efficiency and effectiveness.

A responder's role may be more readily recognized and the personal and professional relationships that may develop, may be strengthened, as a result of having responded together before (experience) or by having trained together (Interval action). So, while roles and relationships may impact an emergency situation, it may be a responder's experience responding with others that has developed that relationship. Therefore, the relationship between the category of roles and relationships and experience is very strong.

In a very telling example, Kyle who is a flight nurse/paramedic responded to a scene where one of the flight paramedics he works with was working on the ground crew. When describing the scene that was most helpful in terms of receiving the information that he needed in order to establish SA, he said, "my comfort, and confidence in the scene and the information I was being given was the presence of one of our flight paramedics, working as a ground paramedic." The fact that he knew and trusted the person based on their professional relationship brought him comfort and confidence. Establishing and maintaining control also mediated the relationship between roles and

relationships and handling information, because communications between providers must take place if efficient action is to be taken.

In the minds of many providers there was a connection between Interval Action – Ongoing and Roles and Relationships that may in some instances create a bypass mechanism circumventing appreciating context and complexity. These providers expressed that if someone that they trusted told them something about the scene, they would accept it. Those whose situational worlds involved primarily patient care, did not feel as strongly about this mechanism, and felt that patient care required a fresh look from them, even if they trusted the person giving report.

Managing resources interacts with the core category directly and with the other categories indirectly through the core. Establishing and maintaining control is highly related to the managing of resources, and when they are poorly controlled, providers either feel over-whelmed or they feel out of control. Requiring and calling for more resources, involves handling information which is an example of the core category's mediation of the other categories, in this case managing resources.

The category of the human element also interacted with and was mediated through the core category. Relationships are depicted in the theoretical model between the human element and establishing and maintaining control because participants said that when emotion was high, less control was established or maintained. Participants felt strongly about compartmentalizing their emotions and addressing them after their responsibilities on the scene had been relieved.

Finally, establishing and maintaining control meant establishing priorities, coordinating efforts and making decisions in an effort to do something. That “something” is insuring a relatively safe scene so that competent and adequate emergency care can be provided to victims of the incident. This involves striking a balance between safety and patient care. Participants felt that the balance reached had to be in favor of safety. This was because if rescuers are injured, then they cannot provide care and they become liabilities rather than assets.

Patient care is very important and a main goal of managing the emergency, but rescuers recognized the need for safe conditions to exist first. Absolute safety is not the condition required; it is relative safety. Rescuers acknowledge that a certain amount of risk is taken to provide patient care in uncontrolled situations. Safety and patient care are balanced, with safety being weighted more heavily. This balance affects interval action - proximal, because how responders perceive that they performed determined the content of the proximal interval action. In addition, on-going patient care and the establishing of safety fed back into the core category of establishing and maintaining control. As these functions were perceived as going well, the responders felt they had more control.

Therefore, the category of establishing and maintaining control anchored and mediated the other categories. Experience and interval actions created a condition of preparation, used by providers to respond to a contextually-based incident. They began handling information and using their senses to appreciate the context and complexity of the scene. The core category mediated handling information, managing resources properly and using roles and relationships while experiencing and compartmentalizing

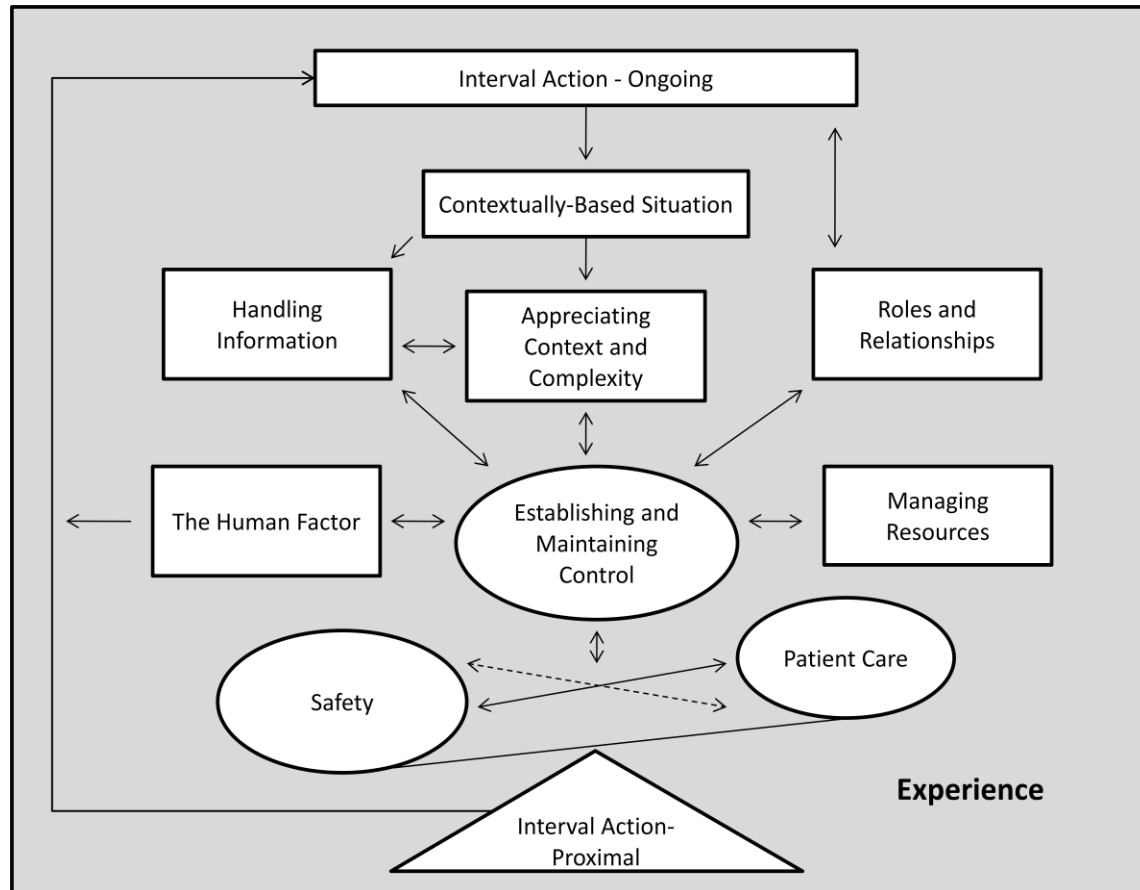
human emotion, to create a relatively safe environment in which to provide patient care. The extent to which this occurred drove further interval actions and resulted in new experience to apply to future responses.

The Substantive Theory

The meticulous development of the categories and the careful appreciation of how they relate to each other based on the participant's words, theoretical sensitivity and rigorous analysis, led to a substantive theoretical model that continued to unfold and evolve throughout the research process. The result is the Busby Theory of Situational Awareness in Multi-Casualty Incidents, seen in Figure 1. By seeking the answers to questions based on the paradigmatic classifications recommended by Corbin and Strauss (2008), appreciating the context of the situations and by acknowledging and illuminating the process of situational awareness, the theory that was developed will add to the current knowledge concerning situational awareness. In addition, by accepting the subtleties that may be present in the situations, the theory while substantive and applying only to MCIs within the parameters of this study, allowed for the process to be seen through the eyes of providers from varying professions, with diverse experiential levels and with varying emergency responsibilities, thereby increasing its utility.

This theory suggests that interval action and experiential history lead to a knowledge-and ability-based condition, which represents a level of preparedness on the part of the provider. In response to a contextually based incident, responders begin handling information in an effort to appreciate the context and complexity of the situation. By employing the key properties of accepting responsibility, establishing

Figure 1. Busby Theory of Situational Awareness in Multi-Casualty Incidents



priorities, coordinating, decision making, and the degree to which the provider saw the scene as controlled, the responder began and continued to establish and maintain control over their own situational world. Establishing and maintaining control falls in the action/interaction/emotion paradigmatic classification. While interacting with and mediating the categories of handling information, managing resources (action/interaction/emotion) and recognizing the roles and relationships (condition), responders experience and yet in many ways compartmentalize human emotion (action/interaction/emotion – consequences) in an effort to create a condition of relative safety in which to provide excellent patient care (consequences). The degree to which control was established and maintained and the perceived adequacy of the balance between safety of the scene and level of patient care provided, and then led to proximal interval actions and to increased experience.

Summary

In this chapter each category of the Busby Theory of Situational Awareness in Multi-Casualty Incidents has been carefully explicated and justified using participant words, theoretical sensitivity and insights into analysis. An explanation has been made concerning the development of categories, properties and dimensions and placement of categories within the paradigmatic classifications put forth by Corbin and Strauss (2008). The relationships among the categories have been explained leading to the development of a new substantive grounded theory, the Busby Theory of Situational Awareness in Multi-Casualty Incidents. Finally, a diagrammatic depiction of the theory has been developed and presented.

CHAPTER FIVE

Discussion, Implications and Recommendations

The purpose of this study was to develop a substantive theory of situational awareness for multi-casualty incidents. Using grounded theory methodology, the Busby Theory of Situational Awareness in Multi-Casualty Incidents emerged. In this chapter, the findings of this study are discussed in light of existing theoretical and conceptual knowledge. In addition, the developed theory is located within the extant nursing theory. Finally, implications for nursing practice, education, and research are discussed.

Findings in Light of Extant Theory and Conceptual Models

Theories and conceptual models introduced in the literature review portion of this study provided a means of informing the research. Theories previously described have been found insufficient on their own for the purposes of MCI. The newly emerged Busby Theory of Situational Awareness in Multi-Casualty Incidents is compared and contrasted with existing theoretical and conceptual SA literature in order to situate in within the state of the science in the area.

Comparisons between the new theory developed here and extant theory discussed in the literature is made to determine points of convergence and divergence. The theory developed in this study is clearly substantive and therefore applies only to SA in MCI, unlike most of the conceptual definitions and theories discussed in the literature review. Most existing SA theories have been applied primarily in aviation.

Some of the conceptual definitions and theories discussed in the literature review were formal and very abstract (Smith & Hancock, 1995). Others were middle-range because they have been applied to several domains. Endsley's (1995a, 2000a) theory is applied to multiple domains. When asked whether she consider her theoretical model of SA formal or mid-range, Endsley stated that "it is quite a formal model", but went on to say later in the conversation that it "has been applied to many domains" (personal communication, February 20, 2009). She obviously feels that it has benefit as both a formal model of SA and a mid-range theory in that it has multi-domain applicability. Whether she considered it formal or mid-range seemed to depend on how it was applied.

Smith and Hancock (1995, p. 137) suggested that SA is "adaptive, externally directed consciousness." This definition is overly abstract to suit the purposes of application to a particular set of circumstances such as those presented in this study. What is useful and applicable however is that the authors explain the importance of agent-environment interaction. Environment in this case, meaning all external factors with which one must deal. This was clearly a factor in the theory developed in this study. Geographic and environmental factors became very important properties of the category of "appreciating context and complexity." Appreciating the context and the complexity of the environment led, in part, to one's ability to establish and maintain control of the situation, which emerged as the core category.

Bedny and Meister (1999, p. 65) are primarily concerned with cognition and suggest that Endsley's model reduces the importance of the "thinking process" without which "there can be no meaningful and dynamic comprehension of the situation." This

focus on the personal cognitive functions of the operator is what Rousseau et al. (2004) called the operator-focused model. Endsley's model and her research over the years has been designed to measure and explain the product of SA, or the knowledge developed in a particular situation at a particular moment in time. While Endsley (personal communication, February 20, 2009) "integrated many existing theories in the cognitive literature" into her own model, she does not really attempt to explain the cognitive processes that lead to SA. She makes clear that she feels there is a mixing of process and product.

The theory generated in this study is committed to process. It is the process of development and maintenance of SA in MCI. This theory should be considered a "situation-focused" model of SA (Rousseau et al. 2004, p. 5), because it explicates the overall flow of macro-level processes and not the micro-level psycho-cognitive processes of the operator personally, though these processes are also involved. However, consistent with existing theories, I found that process leads to product and product, to the need for further process in cyclic fashion.

Process and product interacted in the findings of this study. The process of SA in MCI was discovered in this study. However, product is used during this process. "Decision making" was found to be a primary property of the core category. Decisions are arrived at because of knowledge (the product of SA) that is developed at a particular moment in time during the process of SA. Most SA models assume according to Dekker & Lutzoff (2004, p. 22) that operators are looking for "correspondence-a match or a correlation, between an external world of stimuli and an internal world of mental

representations.” This appears to be true among my participants. But even then, that match is based on the meanings that the information encountered has for the participants. Dekker & Lutzoft (2004, p. 23) go on to say that this can create problems in terms of “the construction of meaning in the head.”

One finding of this study is that separation of product from process is difficult, if not impossible. If product is measured, some process led to its development. If process is studied, the impact of product, somewhere along the way is undeniable. This agrees with the position of Patrick and James (2004) who discussed the difficulty of separating process and product. One of the most pointed definitions of SA, “knowing what’s going on around you”, (Endsley 2000a, p. 5), may be sufficient to describe product, but is insufficient in describing all that the process of SA is in terms of MCI. SA in MCI involves conditions, actions, interactions, emotion and the consequences of them all. Endsley (1995a, p.36) acknowledges that SA is not just arrived at. She states that:

..it is first necessary to distinguish the term *situation awareness*, as a state of knowledge, from the processes used to achieve that state. These processes, which may vary widely among individuals and contexts, will be referred to *situation assessment* or as the process of achieving, acquiring, or maintaining SA.

The separation of *awareness* and *assessment* in this quote, leaves something to the imagination in terms of what is done, once one achieves awareness. Endsley’s model (2000a, p. 3) which has SA at its core, is referred to as the “Model of SA in Dynamic

Decision Making.” She clearly accounts for assessment, awareness and action that is necessary, though not fully explained, especially cognitively. In this study, decisions were found to be an integral part of SA itself. Therefore, they are not separated from the process of SA.

SA in MCI is more than awareness of the information surrounding a responder. Information and resources that are managed, the roles that are played and the emotion experienced all impacted the effort to create safety and provide care. All of the decisions made and actions taken represent SA because they constitute new conditions that will require contemplation, decisions and actions. Therefore the result of SA is itself, information necessary for SA.

Goals also seem to play a role. The participants in this study clearly had major goals; they were providing a safe environment and providing emergency healthcare. Rather than simply happening upon information that they may need, operators may “go looking for data to either confirm or deny this assessment or to fill in questions”, (Endsley, 2004, p. 319). Smith and Hancock (1995, p. 137) state that the “behavior that SA generates must be directed at an external goal and that the “agent’s perception-action cycle supports *skilled* (emphasis mine) performance.” Experience has a strong influence on goal-directed behavior in the findings of this study.

Some of the major concepts and theories reviewed in this study have components that do indeed have commonality with the newly developed theory. However, in terms of the applicability of theory to a particular set of circumstances, the substantive theory developed in this project, is by design, highly specific to MCI and therefore useful only

in this domain. It has yet to be studied in any other. Commonalities of the new theory with other theories and conceptual definitions help to confirm the credibility in areas in which they agree, and call into question those where they do not. The theory developed here is in its infancy. More studies are needed to strengthen and refine the theory. I also acknowledge, in keeping with grounded theory methodology, that the theory provided by this study represents *an* interpretation of SA in MCI, not *the* interpretation.

In terms of literature that discusses field-level incidents in particular, some findings of this study agree either generally or specifically with existing knowledge. Augustine (2006, p. 2) states, “Establishing command requires proper communications, logistics and utilization of emergency resources.” He also states that inclement weather can and does affect the scene in terms of “how patients are managed” (2006, p. 2). In the theory developed in this study, the core category of “establishing and maintaining control” mediates “handling information” (of which communication is a primary property) and “managing resources.” Also “appreciating context and complexity” has as one of its properties, “geographic and environmental conditions.” The results of this study agree in general with Augustine although the specifics about how that is accomplished may not. Additional agreement is found with regard to Limmer et al., (2006, p. 1) who suggested that, “Of all of the tasks we perform as part of the patient assessment, scene safety is arguably the most important.” The findings in this study do not suggest that insuring scene safety is “part of the patient assessment”, but absolutely do agree that safety is one of the most important and maybe the most important factor.

A situation specific definition of situational awareness in MCI can be explicated from the findings of this study. This definition accounts for components necessary for SA in MCI.

The definition is:

SA in MCI is anticipating, perceiving and appreciating the multi-source relevant information pertaining to a particular emergency event or series of events, thereby producing the ability to establish and maintain a degree of control over current conditions and/or project future impact, sufficient to facilitate effective action in planning for and responding to public health and safety needs.

This definition more completely captures the important pieces of what SA is in terms of the needs of public health with respect to SA in MCI.

The Applicability of Nursing Theory

Though participants in this study included those other than nurses, it was important to situate this new theory within existing nursing science. In considering the potential impact of extant nursing theory on this project now and in the future, I was most struck by the fit between Benner's From Novice to Expert theory (1982, 2001) and the findings of this study.

Benner's theory explains the many ways that a nurse goes from a novice to an expert. Parallels exist between Benner's work and the theory developed here, in multiple areas. They include: the experiential necessity of learning, the critical need for stories and

narratives in personal interactions, coordination, the ability to prioritize needs, the problem solving skills that nurses develop with experience, and nurses' ability to visualize themselves as operating "outside the boundaries of nursing" (Benner, 2001, p. 268). Her descriptions are congruent with the findings of this study, particularly those which suggest that experience is the background for the actions/interactions and emotions manifested by the responder.

The theory that has resulted from this study is applicable to those working in emergency response settings and responding to MCI. It is domain-specific. Deepening the contextual impact, each time that different rescuers respond to unique situations (which each MCI is), there are nuanced differences in the context and in the response effort. Benner recognizes that practitioners learn and grow with each clinical situation that they encounter. She states (2001, p. vi), "Practices cannot be completely objectified or formalized because they must ever be worked out anew in particular relationships in real time." Not only does this support the Busby Theory of SA in MCI, but in another way, includes the importance of the role of relationships that emerged in this study which are "particular" to each unique circumstance.

The use of narratives and story-telling in this study are in keeping with Benner's view on the use of these techniques and their ability to enlighten not only the circumstances, but the impact of experience on responders. The stories themselves are the primary means by which the participants in this study conveyed what occurred and the meaning that it held for them. Stories were also used in debriefings, which then contributed to experience and knowledge.

Benner (2001) suggests that coordinating, setting priorities and problem solving improve with experience. This was true of participants in this study, either revealed in their own words, or as seen through the analysis of data. Coordinating with other agencies, establishing priorities and decision making, which may include problem solving were the major properties in the core category of “establishing and maintaining control.” These functions comprise the core category which interacts with and mediates all other categories in the theory.

Benner (2001, p. 146) states that nurses may be practicing at the novice or advanced beginner level before they had “acquired a sense of salience – of perceiving that some things were more important than others.” In this study, it was clear that those with less experience were more concerned with their own functioning, than how the overall scene was going. I think that is what Mike was suggesting when he said it took awhile to develop a “multi-dimensional view.” Some responders discussed the importance of avoiding “tunnel vision.”

Benner (2001, p. 215) comparing expertise with beginner skill, said:

Expertise depends on a meaningful engagement in the situation. The expert rapidly grasps the problem by seeing it in relation to past similar and dissimilar situations and rapidly hones in on the correct region of the problem. The beginner, in contrast must rely on detached, deliberate considerations of as many variables as possible.

The nurse then uses the whole of oneself and all of his or her experiences to come to a conclusion more rapidly and possibly more accurately, than a novice. These are complex processes. Even novice nurses do depend on many cognitive and psychological functions to make decision, perhaps less rapidly. Brooks and Thomas (1997) found that “the nurse as a whole, perceiving, judging, sensing, intuiting, thinking and feeling person makes the clinical decision in a clinical situation.” Therefore, it is not just the memorizing of a protocol, or algorithm that makes nurses and other providers what they are as decision makers, it is experience.

Problem solving, which was not particularly identified, had to have been an unexpressed part of the decision-making process in this study. In some cases the decision and assessments were made by experienced providers with such rapidity that they were almost an afterthought. When I asked Mark, a very experienced rescuer how quickly some of these very important decisions are made, he said:

almost instantaneously, uh, you know, you get out of the truck and in this case, you know we couldn't see the other vehicle because, as a matter of fact we didn't even know we had another vehicle initially when we got off. Got off the truck. You know we walk up, you know, initial impression, you know, car's just about ripped in half. I know we, if somebody's still in the car, I know we got something bad.

Benner (2001, p. 168) discussed intra-facility conditions in which nurses may be required to act in a way that is marginal in terms of nursing care boundaries when she said:

Nurses are expected to manage rapidly changing situations until the physician arrives, but since this puts the nurse outside the usual boundaries of nursing practice, this skilled area is not formally acknowledged or well studied. Yet it is the nurse who calls for and coordinates multiple members of the healthcare team, whether it be by calling the physician or by calling a code blue. It is curious that we have conducted no studies in nursing about the rapid decision making for calling a code blue, despite the fact that nurses must make split second decisions about whether the problem is a simple faint, and artifact of telemetry, or the beginning of a catastrophic problem.

This study was carried out in an environment that is not traditionally seen as routinely including nursing care; the field-level scene of an MCI. This is one of the areas that has been seen as being in the margins of nursing care. Except for those nurses who are part of flight crews, most MCI are not handled in the field by nurses.

In light of daily MCI and recent large-scale events, the circumstances which I have written about are those that nurses need to acknowledge as being within our purview. As Benner (2001, p. 168) suggested functions considered marginal to nursing care will be increasingly “required of the nurse in actual practice”, and because of that

“more documentation and legitimization of this function would probably improve the nurse’s preparation for it.”

Public Health, Nursing Practice, Education and Research

This study has strong implications for public health and nursing practice, education, and research. One of the reasons for studying this area was to suggest that nurses have an important role to play in terms of emergency preparedness. While this study is designed as nursing research, it is also critical that the results be framed within the larger healthcare delivery system to allow for the information to be used in an interdisciplinary manner. Emergency preparedness can no longer be seen as the domain of only one, or a few types of providers.

Public Health

As MCI continue to occur and as we attempt to understand larger-scale incidents in the broader scheme of things, it will become increasingly important that healthcare practitioners from many disciplines come together to better understand how these situations may be handled more effectively through increasingly complex situations, requiring common operating pictures. A greater appreciation of the process of SA in MCI among responders could have an impact on their ability to manage such situations, ultimately improving the provision of safe and effective care and improving public health. By attempting to create relationships through education, drills and training exercises, better cooperation and understanding between responders who may not commonly work together may produce better understanding of professional and team

roles and increase cooperative efforts among professional emergency responders and volunteers utilized during larger-scale events, thus improving overall response efforts.

The suggestion by participants that alcohol use among providers was one of many coping mechanism could also have an impact on public health. Since some emergency responders are occasionally “on call”, there is not only the potential issue of alcohol abuse by providers, but also the concern for impaired providers responding to emergencies, which may have an impact on safe and competent practice, and may require additional research and education.

Nursing Practice

This theory could be implemented by nurses and non-nursing personnel alike, as a possible means of understanding the needs, actions and solutions for safety and care during MCI response in the field. Although it would not provide a “key” to every circumstance, it may improve the rescuers efforts by increasing understanding of SA development, explicating the complexity of the process, and increasing focus and easing decision making in the field. It may also serve to provide a topic of discussion among nurses and other providers, which may focus needed attention on the subject and improve responder and victim safety and patient care in the field.

This project will hopefully increase awareness of the need for SA among nurses working in the field. Including nurses in the study increased the applicability of the theory to nurses currently working in emergency response. This was one of the goals. Nurses may consider using the theory or portions of it that may apply to other areas or domains of nursing. In this era of evidence-based practice, research evidence emerging

from the field can inform future practice. Some portions of the theory may be trialed in emergency departments, intensive care units and other areas where rapid assessment and action are needed.

Nurses could determine how the theory may or may not fit their needs and alter response plans accordingly. Some of the categories and the relationships among them may be isolated to inform practice in situations to which they are seen as applicable. For example, providers may discuss issues regarding “roles and relationships” to determine how best to create relationships among colleagues in their area, which in turn may increase efficiency during actual responses. Roles of providers may also be clarified, which may in turn improve scene management. Categories such as “The Human Element” may provide impetus for discussion of how the culture of an organization might impact critical incident stress debriefing by making it more acceptable and mainstream. These efforts may positively impact psychological coping among nurses and other providers.

Therefore, although the categories and relationships emerged as an integrated theoretical model, portions of the theory may be applicable to certain circumstances in intra-facility nursing and field-level care.

Nursing Education

Nursing education may benefit from the theory put forth in this study. Nursing schools may consider using the theory and information developed as a means of introducing the subject of MCI required SA and management to nursing students and as a tool for teaching MCI and community disaster modules in basic or advanced practice

educational programs. Nursing programs may want to use the theory for education of nursing students for disaster response or homeland security nursing programs. It may also prove useful in field-level or clinical placement nursing education.

The education of nurses, doctors and EMS providers alike typically incorporates some type of learning experiences involving actual patient care under the watchful eye of a trained and seasoned preceptor. The rationale for these clinical experiences is that as the participants of this study said, actual experience in real situations creates learning which cannot be carried out or duplicated in a classroom. Benner (2001, p. vii) states that, “Experiential learning in high-risk situations requires courage and supportive learning environments.” Nursing faculty and instructors must present didactic information and carefully follow that up with actual hands-on learning. It may be that nursing students would benefit from a “ride along” with EMS providers. This would expose them to the uncontrolled environment of the field and to visualizing and partaking in the management of single patient situations and MCI. Some EMS educational programs require paramedic and EMT students to spend clinical time in an emergency department. Nursing schools should consider allowing or even requiring a limited amount of clinical practice time for nursing students to be completed in the field.

Computer programs now have the capability to simulate situations that may be seldom encountered in reality. Providing these realistic experiences may improve the overall functioning of personnel in similar real-life circumstances. Programs such as Virtual Alabama, which I had the opportunity to be involved in, are tremendously helpful in terms of simulating conditions which require high levels of SA. I have had the

opportunity to be involved in and arrange such training opportunities for responders in my area of the country.

Finally, interdisciplinary education and training should occur among healthcare and non-healthcare providers alike. It is important for responders from all disciplines to gain increasing knowledge of the strengths and limitations of each type of response professional. Those who would be requested to respond to an actual event would certainly benefit from this type of “interval action” and this educational strategy would create new and strengthen existing “roles and relationships” within their response areas.

It would be particularly beneficial for nurses to practice acting as part of an interdisciplinary team with regard to emergency response. It may also increase the nursing profession’s credibility among other responders in the area of emergency preparedness, to conduct and participate in interdisciplinary drills. While this model provides the process of SA development and maintenance in MCI, it may also provide a starting point for discussion among emergency responders in terms of larger scale incidents.

Nursing Research

Additional research should be performed to clarify and refine the theory of SA in MCI developed in this study. It is recommended that theory testing be conducted on the entire theory or be focused on more isolated sections of the theory. Portions of the theory may be well-suited to circumstances other than MCI.

One aim of the study was to acquire a sample representing providers from a wide range of disciplinary and experiential (though not necessarily geographic) viewpoints.

This was important since no theoretical models of SA specific to MCI had previously been developed. Therefore, a relatively broad view of the process was desired and accomplished. However, since the results of this project do reflect this view, it may be beneficial to study more narrow experiential and disciplinary groups of providers as well as more geographically diverse groups. The wider geographic range would increase transferability and the more narrow experiential and disciplinary foci may fine tune the theory benefiting specific groups of providers to a greater degree.

Research will also be required to determine if new SA education and practice implementation is somehow associated with improved outcome measures. On an MCI scale, this may be more easily accomplished. It will certainly be more difficult in larger-scale events. However, it is ultimately important to insure that research impacts practice and that practice impacts research.

My research trajectory includes expanding SA research to larger-scale events. Studies should be designed to improve the understanding and application of SA to events larger than the necessary constraints of this work. SA for larger-scale incidents may not have the same requirements for information handling, resource management, appreciating context and many other concepts found to be required for occurrences of the size consistent with this research project. Roles and relationships would almost certainly take on another dimension. Many other requirements may be altered in some expected and some unexpected ways in larger-scale incidents.

It is also important that SA be studied with respect to an emergency manager's hierarchical level. Even among the participants of this study, it was found that some were

functioning in the capacity of IC, while still others were operating on much lower levels of responsibility. In larger-scale situations, managers with ultimate responsibility may be in regional or even national emergency operations centers making decisions based on incoming information, never having been on the scene. The process of SA development in these situations is expected to be different from the process developed in this study. That information is necessary. In testimony before the Subcommittee on Management, Investigations, and Oversight, Committee on Homeland Security, U.S. House of Representatives, Larence (2007, p. 16), was discussing major Department of Homeland Security (DHS) initiatives. In doing so he said one “major” initiative regarding post-Katrina recommendations, was developed to “better share information for situational awareness and decision support.” Offering additional support for this point, in testimony before the Committee on Oversight and Government Reform, House of Representatives, Jenkins (2007), the Director of Homeland Security and Justice Issues stated that:

..the nation’s experience with hurricanes Katrina and Rita reinforced some questions about the adequacy of the nation’s disaster response capabilities in the context of catastrophic disaster – particularly in the areas of (1) situational assessment and awareness, (2) emergency communications, (3) evacuations, (4) search and rescue, (5) logistics and (5) mass care and sheltering.

Based on the lack of research-based theory development regarding SA in MCI and the obvious deficiencies at the national level, the need for additional research regarding SA is

crystal clear. Nurses can and should be on the front line of conducting studies, educating nurses and other healthcare providers and conducting research that will improve local, regional and national emergency preparedness and response efforts.

Summary

This study used grounded theory methodology along with the supporting philosophical stances of pragmatism and symbolic interactionism to discover the process of SA in MCI. Fifteen emergency workers from varying disciplines and experiential backgrounds were interviewed. The transcripts of the interviews were used as the primary source of data, along with field notes and memos. Transcripts were coded using open, focused and axial coding techniques to allow for the emergence of ten overall categories along with their relationships to each other. The analyses which led to the categorical development and the relationships were explicated. The result is the Busby Theory of Situational Awareness in Multi-Casualty Incidents.

This research project has added to the extant knowledge of SA generally and to that of SA in MCI specifically. While providing an interdisciplinary theoretical model for discussion and application, this study has also bridged SA for the first time with extant nursing theory. It has also provided a theory for practice and education and a launch pad for additional research.

References

- Adams, J.A. (2007). Unmanned vehicle situation awareness. Retrieved October 17, 2007 from <http://www.vuse.vanderbilt.edu/~adamsja/paper>.
- Alm, A.M., Gao, T., & White, D. (2006). Pervasive patient tracking for mass casualty incident response. *AMIA 2006 Symposium Proceedings*, 842.
- American Medical Association & National Disaster Life Support Foundation. (2004). Advanced disaster life support provider manual, version 2.0. American Medical Association: United States.
- Anderson, G., & Rorty, M.V. (2001). Key points for developing an international declaration on nursing, human rights, human genetics and public health policy. *Nursing Ethics*, 8, 259-271.
- Artman, H. (1999). Situation awareness and co-operation within and between hierarchical units in dynamic decision-making. *Ergonomics*, 42, 1404-1417.
- Artman, H. (2000). Team situation assessment and information distribution. *Ergonomics*, 43, 1111-1128.
- Auf der Heide, E. (2006). The importance of evidence-based disaster planning. *Annals of Emergency Medicine*, 47, 34-49.
- Augustine, J. (2006). Managing your scene. *Emergency Medical Services*, 35(2), 36-38.
- Bedny, G., & Meister, D. (1999). Theory of activity and situation awareness. *International Journal of Cognitive Ergonomics*, 3, 63-72.
- Benner, P. (1982). From novice to expert. *American Journal of Nursing*, 82, 402-407.
- Benner, P. (2001). *From novice to expert. Excellence and power in clinical nursing practice* (Commemorative Edition). New Jersey: Prentice Hall Health.

- Blandford, A., & Wong, B.L.W. (2004). Situation awareness in emergency medical dispatch. *International Journal of Human-Computer Studies*, 61, 421-452.
- Blumer, H. (1969). *Symbolic interactionism: perspective and method*. University of California Press: Berkley.
- Bond, S., & Cooper, S. (2006). Modelling emergency decisions: recognition-primed decision-making. The literature in relation to an ophthalmic critical incident. *Journal of Clinical Nursing*, 15, 1023-1032.
- Bradley, C.A., Rolka, H., Walker D., & Loonsk, J. (2005). BioSense: implementation of a national early event detection and situational awareness system. *Morbidity and Mortality, Weekly Report*, 54, 11-19.
- Brooks, E.M. & Thomas, S. (1997). The perception and judgment of senior baccalaureate student nurses in clinical decision making. *Advances in Nursing Science*, 19(3), 50-69.
- Charmaz, K. (2006). *Constructing grounded theory, a practical guide through qualitative analysis*. Thousand Oaks, CA: Sage Publications, Inc.
- Corbin, J., & Strauss, A. (2008). *Basics of qualitative research* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.
- Cotter, S. (2006). Treatment area consideration for mass casualty incidents. *Emergency Medical Services*, 35(2), 48-51.
- Crandall, B., & Getchell-Reiter, K. (1993). Critical decision method: a technique for eliciting concrete assessment indicators from the intuition of NICU nurses. *Advances in Nursing Sciences*, 16, 42-51.

- Crandall, B., Klein, G., & Hoffman, R.R. (2006). *Working Minds: A practitioner's guide to cognitive task analysis*. Cambridge, MA: The MIT Press.
- Creswell, J.W. (2003). Review of the literature. In *Research design, qualitative, quantitative, and mixed methods approaches* (3rd ed.) (pp. 27-48). Thousand Oaks, CA: Sage Publications, Inc.
- DeFraités, R.F., & Chambers, W.C. (2007). Gaining experience with military medical situational awareness and geographic information systems in a simulated influenza epidemic. *Military Medicine*, 172, 1071-1076.
- Dekker, S. & Lutzhoft, M. (2004). Cognition and sensemaking: a radical empiricist view of situation awareness. In S. Banbury & S. Tremblay (Eds.), *A cognitive approach to situation awareness: theory and application* (pp. 317-341). Burlington, VT: Ashgate.
- Demchak, B., Chan, T.C., Griswold, W.G., & Lenert, L. (2006). Situational awareness during mass-casualty events: command and control. *AMAI 2006 Symposium Proceedings*, 905.
- Dewey, J. (1929). *The quest for certainty*. New York: Minton, Balch & Company.
- Dufflin, C. (2005). Nurses work with paramedics to hit 30-minute target for thrombolysis. *Nursing Standard*, 19(41), p. 10.
- Edery-Halpern, G., & Nachson, I. (2004). Distintiveness in flashbulb memory: Comparative analysis of five terrorist attacks. *Memory*, 12(2), 147-157. Retrieved June 9, 2009 from PsychInfo.

- Eid, J., Johnsen, B.H., Brun, W., Laberg, J.C., Nyhus, J.K., & Larsson, G. (2004). Situation awareness and transformational leadership in senior military leaders: an exploratory study. *Military Psychology, 16*, 203-209.
- Endsley, M.R. (1988). Design and evaluation for situation awareness enhancement. *Proceedings of the Human Factors Society 32nd Annual Meeting*, 97-101.
- Endsley, M.R. (1993). A survey of situation awareness requirements in air-to-air combat fighters. *The International Journal of Aviation Psychology, 3*, 157-168.
- Endsley, M.R. (1995a). Toward a theory of situation awareness in dynamic systems. *Human Factors 37*, 32-64.
- Endsley, M.R. (1995b). Measurement of situation awareness in dynamic systems. *Human Factors 37*, 65-84.
- Endsley, M.R. (1996). Situation awareness measurement in test and evaluation. In T.G. O'Brien & S.G. Charlton (Eds.), *Handbook of human factors testing and evaluation* (pp. 159-285).
- Endsley, M.R. (2000a). Theoretical underpinnings of situation awareness: A critical review. In M.R. Endsley & D.J. Garland (Eds.), *Situation awareness, analysis, and measurement* (pp. 3-32). Mahwah, NJ: Lawrence Erlbaum Associates.
- Endsley, M.R. (2000b). Direct measurement of situation awareness: Validity and use of SAGAT. In M.R. Endsley & D.J. Garland (Eds.), *Situation awareness, analysis, and measurement* (pp. 147-174). Mahwah, NJ: Lawrence Erlbaum Associates.

- Endsley, M.R. (2004). Situation awareness: progress and directions. In S. Banbury & S. Tremblay (Eds.), *A cognitive approach to situation awareness: Theory and application* (pp. 317-341). Burlington, VT: Ashgate.
- Endsley, M.R., & Bolstad, C.A. (1994). Individual differences in pilot situational awareness. *The International Journal of Aviation Psychology*, 4, 241-264.
- Epstein, B. (Executive Producer). (2009, February 23). *The NBC nightly news with Brian Williams* [Television broadcast]. New York, NY: National Broadcasting Corporation.
- Esler, D. (2006). Mapping the airport: increasing situational awareness on the ground. *Business & Commercial Aviation*, 99(6), 1-4.
- Federico, P. (1995). Expert and novice recognition of similar situations. *Human Factors*, 37, 105-122.
- Feibush, E., Gagvani, N., & Williams, D. (2000). Visualization for situational awareness. *IEEE Computer Graphics and Applications*, 38-45.
- Flach, J.M. (1995). Situation awareness: proceed with caution. *Human Factors*, 37, 149-157.
- Gaba, D.M., Howard, S.K., & Small, S.D. (1995). Situation awareness in anesthesiology. *Human Factors*, 37, 20-31.
- Garshnek, V., Shinch, K., & Burkle, Jr., F.M. (1998). Disaster assessment and satellite communication: on the threshold of a new era. *Space Policy* 14, 223-227.
- Guisse, J. (2006). Do you speak SBAR? *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 35, 313-314.

- Horrocks, C. (2004). Working together. *Primary Health Care*, 14, pp. 23-25.
- Jenkin, A., & Endacott, R. (2002). Interprofessional education. *Emergency Nurse*, 9(10), pp. 14-16.
- Jenkins, W. (2007). *Observations on DHS and FEMA efforts to prepare for and respond to major and catastrophic disasters and address related recommendations and legislation*. (GAO-07-1142T). Washington, DC: Government Accountability Office.
- Johnson, G.A., & Calkins, A. (1999). Prehospital triage and communication performance in small mass casualty incidents: a gauge for disaster preparedness. *American Journal of Emergency Medicine*, 17, 148-150.
- Jones, D. (2000). Subjective measures of situation awareness. In M.R. Endsley & D.J. Garland (Eds.), *Situation awareness, analysis, and measurement* (pp. 113-128). Mahwah, NJ: Lawrence Erlbaum Associates.
- Kaber, D.B., Perry, C.M., Segall, N., McClernon, C.K., & Prinzel, III, L.J. (2006). Situation awareness implications of adaptive automation for information processing in an air traffic control-related task. *International Journal of Industrial Ergonomics*, 36, 447-462.
- Kirlik, A., & Strauss, R. (2006). Situation awareness as judgment I: statistical modeling and quantitative measurement. *International Journal of Industrial Ergonomics*, 36, 463-474.

- Klein, G. (1993). A recognition-primed decision (RPD) model of rapid decision-making. In G.A. Klein, J. Orasanu, R. Calderwood & C. Zsombok (Eds.), *Decision-making in action: Models and methods*. New Jersey: Ablex Publishing Corporation. (pp. 138-147).
- Klein, G. (1998). *Sources of power: how people make decisions*. MIT Press: Cambridge, MA.
- Koudelka, O., & Schrotter, P. (2006). Satellite services for disaster management and security applications. *Acta Astronautica*, 60, 986-991.
- Lampton, D.R., Cohn, J.V., Endsley, M.R., Freeman, J., Gately, M.T., & Martin, G.A. (2005). *Measuring situation awareness for dismounted infantry squads*. Paper presented at the 2005 Interservice/Industry Training, Simulation, and Education Conference. Abstract retrieved October 19, 2007, from http://www.aptima.com/publications/2005_lam.
- Larence, E.R. (2007). *Guidance from operations directorate will enhance collaboration among departmental operations centers*. (GAO-07-683T). Washington, DC: Government Accountability Office.
- Levine, W.C., Meyer, M., Brzezinski, P., Robbins, J., & Sandberg, W.S. (2005). Computer automated total perioperative situational awareness and safety systems. *International Congress Series*, 1281, 856-861.
- Limmer, D., Mistovich, J.J., & Krost, W.S. (2006). Beyond the basics: scene safety. *Emergency Medical Services* 35, 70-74.

- Lockheed-Martin (2007). Lockheed-Martin A-10 prime team delivers situational awareness capability to U.S. Air Force for flight testing. *Military & Aerospace Electronics*, 20.
- Luzwick, P. (2000). Situational awareness and OODA loops, coherent knowledge-based operations applied. *Computer Fraud and Security*, 2000(4), 15-17.
- Ma, R. & Kaber, D.B. (2005). Situation awareness and workload in driving while using adaptive cruise control and a cell phone. *International Journal of Industrial Ergonomics* 35, 939-953.
- Marsh, E.J. (2007). Retelling is not the same as recalling- implications for memory. *Current Directions in Psychological Science*, 16, 16-20. Retrieved June 9, 2009 from PsychInfo.
- Mass Casualty Event Preparedness and Response. Retrieved from Centers for Disease Control and Prevention web site <http://emergency.cdc.gov/masscasualties/> on April 5, 2008
- Matthews, M.D., Strater, L.D., & Endsley, M.R. (2004). Situation awareness requirements for infantry platoon leaders. *Military Psychology*, 16, 149-161.
- McCurdy, N.J., Griswold, W.G., & Lenert, L.A. (2005). Reality flythrough: enhancing situational awareness for medical response to disasters using ubiquitous video. *AMIA 2005 Symposium Proceedings*, 510-514
- McHale, J. (2006). Navy Burke-class destroyers enhance situational awareness with RGB system. *Military & Aerospace Electronics*, 6 and 39-40

- Mechanic, D., & Reinhard, S.C. (2002). Contributions of nurses to health policy: challenges and opportunities. *Nursing and Health Policy Review*, 1, 7-15.
- Melby, V. (2000). Experiential learning in pre-hospital emergency care: a qualitative study. *Nurse Education Today*, 20, 638-645.
- Miller, A. (2006). Situational awareness – from the battlefield to the corporation. *Computer Fraud & Security*, 2006(9), 13-16.
- Moss, M.L., Kaufman, S.M., & Townsend, A.M. (2006). The relationship of sustainability to telecommunications. *Technology in society*, 28, 235-244.
- Myers, J. (2007). Improving acquisition execution situational awareness. *Contract Management*, 47, 6-10
- The Nursing Shortage: Causes, impact and innovative remedies: hearing before the committee on education and workforce (2001). Presented by Mary E. Foley. Washington, D.C.
- O'Hare, D. (1997). Cognitive ability determinants of elite pilot performances. *Human Factors*, 39, 540-553.
- Oloufa, A.A., Ikeda, M., & Oda, H. (2003). Situational awareness of construction equipment using GPS, wireless, and web technologies. *Automation in Construction*, 12, 737-748.
- Patrick, J. & James, N. (2004). The concept of the situation in psychology. In S. Banbury & S. Tremblay (Eds.), *A cognitive approach to situation awareness: theory and application* (pp. 61-81). Burlington, VT: Ashgate.

- Patrick, J., James, N., Ahmed, A., & Halliday, P. (2006). Observational assessment of situation awareness, team differences and training implications. *Ergonomics*, 49, 393-417.
- Pew, R.W. (2000). The state of situation awareness measurement: heading toward the next century. In M.R. Endsley & D.J. Garland (Eds.), *Situational awareness analysis and measurement* (pp. 33-47).
- Proctor, M.D., Panko, M., & Donovan, S.J. (2002). Considerations for training team situation awareness and task performance through PC-gamer simulated multiship helicopter operations. *The International Journal of Aviation Psychology*, 14, 191-205.
- Public Health Policy Needs Nurses (2004). *Australian Nursing Journal*, 11, 15.
- Raytheon awarded Air Force contract for space situational awareness improvements demonstration (2006). *Military & Aerospace Electronics*, 9.
- Reis, B.Y., Kirby, C., Hadden, L.E., Olson, K., McMurry, A.J., Daniel, J.B., et al., (2007). AEGIS: a robust and scalable real-time public health surveillance system. *Journal of the American Medical Informatics Association*, 14, 581-588.
- Rhea, J. (2004). UAVs provide situational awareness in Iraq. *Military & Aerospace Electronics*, 12.
- RNs can participate in EMS preceptor activities in medical care facilities – paramedic training and RN role. (2005) *The Kansas Nurse*, 80, p. 4.

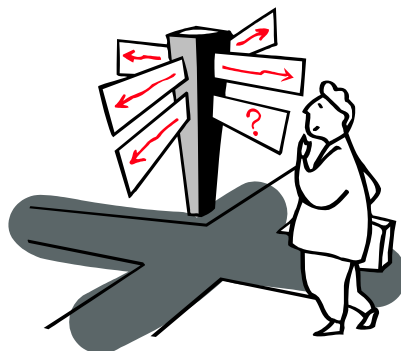
- Rodgers, K. (March/April 2007). Using the SBAR communication technique to improve nurse-physician phone communication: A pilot study. *AAACN Viewpoint*, 29, 7-9.
- Rodriguez, P.A., Geckle, W.J., Barton, J.D., Samsundar, J., Gao, T., Brown, M.Z., et al. (2006). An emergency response UAV surveillance system. *AMAI 2006 Symposium Proceedings*, 1078.
- Rousseau, R., Tremblay, S., & Breton, R. (2004). Defining and modeling situation awareness: a critical review. In S. Banbury & S. Tremblay (Eds.), *A cognitive approach to situation awareness: Theory and application* (pp. 3-21). Burlington, VT: Ashgate.
- Salmon, P., Stanton, N., Walker, G., & Green, D. (2006). Situation awareness measurement: a review of applicability for C4i environments. *Applied Ergonomics*, 37, 225-238.
- Sarter, N.B. & Woods, D.D. (1991). Situation awareness: a critical but ill-defined phenomenon. *The International Journal of Aviation Psychology*, 1, 45-57.
- Saus, E.R., Johnsen, B.H., Eid, J., Riisem, P.K., Andersen, R., & Thayer, J.F. (2006). The effect of brief situational awareness training in a police shooting simulator: an experimental study. *Military Psychology* 18(Suppl.), S3-S21.
- See, J.E., & Vidulich, M.A. (1997). Computer modeling of operator mental workload and situational awareness in simulated air-to-ground combat: an assessment of predictive validity. *International Journal of Aviation Psychology*, 8, 351-375.

- Siemieniuch, C.E., & Sinclair, M.A. (2008). Using corporate governance to enhance 'long-term situational awareness' and assist in the avoidance of organization [sic]-induced disasters. *Applied Ergonomics*, 39, 229-240.
- Simplified START/JumpSTART algorithms suitable for pocket card. Retrieved from http://www.jumpstarttriage.com/uploads/START_JumpSTART_card.doc on April 5, 2008.
- Smith, K., & Hancock, P.A. (1995). Situation awareness is adaptive, externally directed consciousness. *Human Factors* 37, 137-148.
- Stanton, N.A., Chambers, P.R.G., & Piggott, J. (2001). Situational awareness and safety. *Safety Science* 39, 189-204.
- Stommel M., & Wills, C. (2004). *Clinical research concepts and principles for advanced practice nurses*. Philadelphia: Lippincott Williams & Wilkins.
- Strauss, A. & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA:Sage.
- Strauss, R., & Kirlik, A. (2006). Situation awareness as judgment II: experimental demonstration. *International Journal of Industrial Ergonomics*, 36, 476-484.
- Suserud, B., & Bruce, K. (2003). Ambulance nursing part three. *Emergency Nurse*, 11(2), pp. 16-21.
- Suserud, B., Bruce, K. & Dahlberg, K. (2003a). Initial assessment in ambulance nursing. *Emergency Nurse*, 10(10), pp. 13-17.
- Suserud, B., Bruce, K. & Dahlberg, K. (2003b). Ambulance nursing assessment part two. *Emergency Nurse*, 11, pp. 14-18.

- Svensson, E., Angelborg-Thanderz, M., Sjöberg, L., & Olsson, S. (1997). Information complexity-mental workload and performance in combat aircraft. *Ergonomics*, 40, 362-380.
- United States Coast Guard (2007). *Situational Awareness*. Retrieved September 22, 2007 from http://www.dirauxwest.org/TCTF/situational_awareness5.htm.
- Westbrook, I. & Ampt A. (2009). Design, application and testing of the work observation method by activity timing (WOMBAT) to measure clinicians' patterns of work and communication. *International Journal of Medical Informatics*, 78S, S25-S33. Retrieved June 8, 2009 from Science Direct.
- You, Y., & Pekkola, S. (2001). Meeting others – supporting situation awareness on the WWW. *Decision Support Systems*, 32, 71-82.
- Zsombok, C.E., & Klein, G. (Eds.) (1997). *Naturalistic decision-making*. Lawrence Erlbaum Associates: Mahwah, New Jersey.
- Zoraster, R.M., Chidester, C., & Koenig, W. (2007). Field triage and patient maldistribution in a mass-casualty incident. *Prehospital and Disaster Medicine*, 22, 224-229.

Appendices

Appendix A: Recruitment Flyer



Do you know what's going on around you?

If you do, then you have “Situational Awareness”

If you are an emergency responder (EMT, paramedic, nurse or physician), have at least one year of experience and have been to a multi-casualty scene (2-25 patients) to provide care, then you can tell me what was going on around you.

I am conducting a research study that is attempting to uncover the process of situational awareness in multi-casualty incidents and I need your help! Your experience is important to me. I'm a former paramedic, now an advanced practice nurse, current faculty member at UAH and PhD student at UT performing research.

Your participation would include an interview requiring approximately 60 minutes of your time and will be conducted at your convenience at a location convenient to you (not while on duty please).

If you think you have experiences that would be helpful in improving our knowledge in this area, and would like to know more, please contact:

Steve Busby, University of Alabama in Huntsville
Office (256) 824-2437
Cell (256) 503-0551
Email: busbys@uah.edu

Appendix B: IRB Approval Form



THE UNIVERSITY of TENNESSEE

**Institutional Review Board
Office of Research**1534 White Avenue
Knoxville, TN 37996-1529
Phone: 865.974.3466
Fax: 865.974.7400

July 28, 2008

IRB#: 7682 B

TITLE: Situational Awareness in Multi-Casualty Incidents: Theory Development from the Field

Busby, Steven
Nursing
112 Edgebrook Drive
Ardmore, AL 35739Witucki-Brown, Janet
Nursing
1200 Volunteer Blvd.
Campus - 4180

Your project listed above was reviewed and has been granted IRB approval under Expedited review.

This approval is for a period ending one year from the date of this letter. Please make timely submission of renewal or prompt notification of project termination (see item #3 below).

Responsibilities of the investigator during the conduct of this project include the following:

1. To obtain prior approval from the Committee before instituting any changes in the project.
2. If signed consent forms are being obtained from subjects, they must be stored for at least three years following completion of the project
3. To submit a Form D to report changes in the project or to report termination at 12-month or less intervals.

The Committee wishes you every success in your research endeavor. This office will send you a renewal notice (Form R) on the anniversary of your approval date.

Sincerely,

Brenda Lawson
Compliances

Appendix C: Research Study Information Sheet

Research Study Information Sheet

Situational Awareness in Multi-casualty Incidents: Theory Development from the Field

Principal Investigator: Steven Busby

INTRODUCTION

You are invited to participate in research study that is designed to help the researcher understand how medical responders in the field develop information about situations in which multiple people are injured, in order to make decisions about their care and safety.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

After reading this information sheet, any questions you may have will be answered. Should you then decide to participate, you will be asked to sign a consent form, and fill out a short demographic sheet (age, gender etc.). Then, the researcher (Steve Busby) will interview you for approximately 60 minutes and ask you questions about a particular event of your choice, to which you have responded, that required the care of more than one, but no more than 25 people. The interview may last longer or shorter than 60 minutes depending how much time you feel you need to tell the researcher what you would like him to know.

The interview will be audio taped and then typed and stored on compact discs. As soon as the typed record of your interview is reviewed for accuracy, your audio taped interview will be destroyed. Neither your name, nor that of your employing/volunteer agency will be a part of the typed record. Only the researcher will have a list of the participant's names, and they will be kept confidential. There will be qualified researchers assisting me with the evaluation of the information in your interview, but they will not be able to identify you in any way. Your actual words may be utilized in the research findings, but all referrals to names, agencies and other identifying information will be removed. You may be asked for permission to be re-interviewed by the researcher at a later date in order to clarify some information. Agreeing to be interviewed initially, in no way obligates you to subsequent interviews, and you may refuse to be interviewed later without penalty.

RISKS

The risks to you are minimal. Talking about a situation that was in some way difficult for them may emotionally upset some people. If you become upset and would like to discontinue the interview, you may do so at any time. If you would like to continue the interview after some period, you may. If you would like to completely discontinue the interview, you may do that without any penalty.

BENEFITS

Talking about an important situation may be in some ways helpful psychologically to some people. You also may feel that you are assisting with improving emergency services by offering to participate in this project. However, you may not realize any personal benefit from having participated in the research study.

CONFIDENTIALITY

The researcher (Steve Busby) is the only person who will have access to the names of the participants, other than the transcriptionist who may hear references to identifying information on the audiotapes. The transcriptionist has signed a confidentiality statement, and is in no way allowed to discuss any information concerning the study. The names of the participants, the typed transcripts, and the compact discs containing stored transcripts will be maintained in a locked file cabinet in the researcher's office. Some research materials without any identifiers may be secured on the password protected office computer of the researcher. Other researchers who will be assisting the primary researcher (Steve Busby), will be reviewing the transcribed information, but will not have any identifying information about you. The typed transcripts will be kept and possibly utilized in future studies. Again, no identifying information will be on those transcripts.

COMPENSATION

No compensation will be provided to you as a participant. Your participation is completely voluntary.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.

CONTACT

If you have questions at any time about the study or the procedures, you may contact the researcher:

Steven Busby
328 Nursing Building
University of Alabama in Huntsville
Huntsville, AL 35899

Office - (256) 824-2437

If you have questions about your rights as a participant, contact the Office of Research [Compliance Officer](#) at (865) 974-3466.

Appendix D: Informed Consent Form

Informed Consent Form

Situational Awareness in Multi-Casualty Incidents: Theory Development from the Field

Principal Investigator: Steven Busby

You are invited to participate in a research study of emergency responders. The goal of this study is to obtain information about how emergency responders gather and process information in emergency situations to determine how they know what is going on around them on an emergency scene. Hopefully this knowledge will improve emergency response.

As the principal investigator, I will ask you for your thoughts, feelings ideas and experiences related to an emergency that you personally were involved in. You will be asked to participate in an audio taped interview at a time and location of your choice. The interview will last as long as necessary to allow you to share your experience. These interviews typically last between 45 and 60 minutes, but may be longer or shorter depending on what you have to say. You will be asked to share your experiences, thoughts, and feelings regarding information you found particularly important in handling the scene and how that information was obtained, maintained and updated. Other questions will follow based on what you share with me. The interview will be audio taped in order for me to use your exact words to compare with words of other responders in the study. There are no right or wrong answers to the questions posed. Your experience, to the best of your ability to recall it, is what is important to me.

There will be between 12 and 30 responders included in this study. All interviews will be typed into written form to allow for analysis. Your name will not appear on the audiotape or the typed copy and will be known only to me. Information in the typed copies will be kept confidential. All copies, with no identifying information, will be kept in a locked file drawer in my office. I, or an assistant, may contact you following the interview to make sure that I understood your comments and thoughts. The information obtained in this study may be put together with other information for future projects related to volunteer activities and elder health.

As a volunteer in this study, you will not be paid for your time and effort in participating in this study. You may benefit from having someone to discuss your experiences with and from insights gained as a result of discussion.

Participants Initials _____

You are free to answer or not answer any questions. Your participation in this study is entirely voluntary. You may choose not to participate or to withdraw at any time during the study without any penalty or loss of present or future benefits to which you are otherwise entitled. Your audiotape will be destroyed if you withdraw from this study. Any information you provide will be kept in confidence. Your name will not be used in any reports although your words may be used to support interpretation and analysis. At no time will your words be identifiable with your name.

If you have questions at any time about the study or the procedures, you may contact the Principal Investigator. Contact information appears below. If you have questions about your rights as a participant, contact the University of Tennessee, Knoxville, Compliance Section of the Office of Research at (865) 974-7697, or write them at 1534 White Ave., Knoxville, TN 37996-1529.

If you have questions about your rights as a participant, contact the Office of Research [Compliance Officer](#) at (865) 974-3466.

Steven Busby
328 Nursing Building
University of Alabama in Huntsville
Huntsville, AL 35899
Office - (256) 824-2437

CONSENT

I have read the above information. I have received a copy of this form. I agree to participate in this study.

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix E: Research Demographic Form

Research Demographic Form

Situational Awareness in Multi-Casualty Incidents: Theory Development from the Field

Principal Investigator: Steven Busby

Please do not place any personally identifying information on this form (name, address employer etc.). You may choose not to respond to any of these items without penalty.

1. What is your age? _____
2. Are you female _____ or male _____?
3. What is your ethnicity? _____
4. How many full years of service as an emergency responder? _____
5. Are you a(n) EMT_____ Paramedic_____ Nurse_____ Physician _____
6. Are you a paid _____ or volunteer _____ responder?
7. Are you still working in emergency response? Yes_____ No _____

Appendix F: Transcriber's Pledge of Confidentiality

Transcriber's Pledge of Confidentiality

**Study: Situational Awareness in Multi-Casualty Incidents: Theory
Development from the Field
Principal Investigator: Steven Busby**

As a transcribing typist of this research project, I understand that I will be hearing tapes of confidential interviews. Research participants who participated in this project on good faith have revealed the information on these tapes with the understanding that their interviews would remain strictly confidential. I understand that I have a responsibility to honor this confidentiality agreement. I hereby agree not to share any information on these tapes with anyone except the primary researcher of this project. Any violation of this agreement would constitute a serious breach of ethical standards, and I pledge not to do so.

Transcribing Typist

Date

Appendix G: Audit Trail

Audit Trail for Research Project, Situational Awareness in Multi-Casualty Incidents

Category	Focused	Open	Paradigm
Appreciating Context and Complexity		good, meaning serious	Action/ Interaction/ Emotion
“		accepting tragedy as typical	
“		acting on speculation	
“		“all this stuff going on at one time”	
“		“and when you hear those words – people are in there – that changes everyone’s mind”	
“		appreciating the scope	
“		being prepared	
“		being unsure of the problem	
“		“Cause you don’t expect to see that in a mass situation”	
“		chaos and confusion	
“		concerns for abandonment	
“		dividing attention	
“		“even in that moment of chaos...everybody stepped up and did what was required of them”	
“		extrication became difficult	
“		gravity of the situation	
“		high traffic area	
“		“it was nighttime and it was cold”	
“		“it was really cut and dry”	
“		LZ on the scene	
“		many considerations	
“		most common event	
“		never really knowing	
“		not knowing the problem	
“		one size fits all response	
“		“So I’m sure the	

Category	Focused	Open	Paradigm
		coordinators at that point knew they had a disaster on their hands”	
“		“so many variables”	
“		“that’s just the way it goes”	
“		“the bus driver panicked and exited the vehicle”	
“			
“		“they were uh, stressed out”	
“		“time gets skewed when you’re in the middle of that”	
“		unique situation	
“		varying mechanisms	
“		visually obstructed	
		“we’re standing on a muddy hill”	
“	Actually Perceiving	not being able to see it	
“	“	anticipating needs	
“	“	arriving first	
“	“	“before my feet ever hit the ground”	
“	“	do a quick size-up	
“	“	do sort of a scene triage	
“	“	first concentration	
“		establishing that which lays out your work scene	
“	“	initial assessment – most important	
		initial perceptions	
“	“	perceiving the scene	
“	“	perceiving cues	
“	“	line of sight	
“	“	visual cues to seriousness	
“	“	visualizing the scene	
“	“	“you kinda gotta go based on what you see”	
“	Anticipating and Envisioning	“as a time to remind myself and bring everything to the front of my mind, that I need for this scene”	

Category	Focused	Open	Paradigm
		anticipating critical situation	
“	“	cues lead to probable findings	
“	“	“I was preparing in my head before I got to the scene what to expect”	
“	“	cues lead to probable findings	
“	“	“it could be ugly”	
“	“	“it just hadn’t happened yet”	
“	“	knowing it’s bad	
“	“	planning action based on report	
“	“	preparing for arrival	
“	Dynamic circumstances	changing circumstances	
“	“	changing conceptions	
“	“	expecting the unexpected	
“	“	“I stood everybody down”	
“	“	lack of patient cooperation	
“	“	needing traffic control	
“	“	patient doesn’t want to be found	
“	“	patient hiding	
“	“	pre-planning helps in dynamic circumstances	
“	“	“the bus driver panicked and exited the vehicle”	
“	“	the unexpected occurring	
“	Geographic and Environmental Considerations	being impacted by the scope	
“	“	“a crap shoot”	
“	“	geographic factors	
“	“	having two different locations	
“	“	it was out in a rural area	
“	“	“it was pretty dark outside”	
“	“	“it was very smoky, very hot, very, very hot	
“	“	multiple scenes in one	

Category	Focused	Open	Paradigm
	“	out of visual or walking range	
	“	proximity of the patients to each other	
	“	“two locations that very spread apart”	
	“	“two separate incidents”	
	“	working conditions weren’t favorable	
Contextually-Based Situation		1077 (In Vivo, deceased)	Condition
	“	“a microburst is a microburst and there’s no control over it”	
	“	car wedged under a bus	
	“	“gone postal on us”	
	“	heat related event involving two toddlers	
	“	“I know the people and they’re still inside”	
	“	multiple injuries and multiple ejections	
	“	MVA	
	“	people passing out in a bar	
	“	structure fire	
	“	“the bottom dropped out”	
	“	“the call is a MVC with possible entrapment”	
	“	“we responded to a triple shooting”	
	“	weather event	
Establishing and Maintaining Control		accepting responsibility	Action/ Interaction/ Emotion
	“	accountability	
	“	assessing the scene	
	“	bearing the early arrival burden	
	“	“by them panicking almost caused us some really big problems”	
	“	controlling family empathetically	

Category	Focused	Open	Paradigm
“		“dealing with a bigger issue”	
“		developing a multi-dimensional view	
“		empathy for the IC	
“		establishing command early	
“		establishing control by avoiding tunnel vision	
“		establishing two scenes	
“		feeling overwhelmed	
“		giving orders	
“		handling everything early	
“		“I lost SA”	
“		“it required some restraint”	
“		“I’ve always seen incident command being right there.”	
“		lacking clear leadership	
“		lines of authority	
“		maintaining control	
“		multi-level ICs	
“		no clear perimeter	
“		no contact with the IC	
“		“one must lead the troops”	
“		ready to respond	
“		restructuring staff for IC	
“		scene size-up	
“		setting up the perimeter	
“		setting up care area	
“		shifting command	
“		textbook incident	
“		command is atypical	
“		“the state troopers had a pretty long response time”	
“		“the wagon wheel theory”	
“		“there was no control at all”	
“		trying to concentrate on one thing	
“		trying to determine what was going on	

Category	Focused	Open	Paradigm
“		unheard of concept	
“		well-controlled scene has a	
		positive impact	
“	Coordinating Efforts	cooperating	
“	“	dealing with the news media	
“	“	“doing his policeman thing”	
“	“	lacking territorialness	
“	“	law enforcement acting	
“	“	managing disagreement	
“	“	news media as a resource	
“	“	“nobody’s in a turf battle”	
“	“	“put those egos aside”	
“	“	seamlessness of the operation	
“	“	“two different purposes”	
“	“	understanding between agencies	
“	“	“you gotta train together”	
“	Establishing Priorities	scene safety is the first priority	
“	“	“you start dealing with it as you make it smaller”	
“	“	acting on perceived priorities	
“	“	assessing risk and benefit	
“	“	changing priorities based on patient age	
“	“	establishing priorities	
“	“	“it comes down to priorities”	
“	“	prioritizing injuries	
“	“	surveying the scene	
“	Establishment and Transfer of Command	assuming control	
“	“	establishing command	
“	“	“I had to relinquish the scene”	
“	“	making a determination	
“	“	organizing the effort	

Category	Focused	Open	Paradigm
“	“	transfer of command	
“	Making Decisions	“as your number of patients grow, your number of viable patients diminish”	
“	“	making critical decisions	
“	“	anticipating decisions	
“	“	bringing in another decision-maker	
“	“	deciding not to divert resources	
“	“	deciding on transport	
“	“	“I’ve got to go in and get the rest of these people out of here quick or they’re not gonna live.”	
“	“	making a determination	
“	“	making choices	
“	“	making choices with incomplete information	
“	“	making difficult decisions	
“	“	“making those decisions on the fly”	
“	“	rapid decision-making	
“	“	risks of wrong decisions	
“	“	sees working as action	
“	“	“trying to make a decision and decide”	
“	“	“we had to make those decisions very quickly”	
“	“	weighing the options	
Experience	Experience as a Factor		Condition
“	“	acknowledging subtle differences between among responses	
“	“	building a frame of reference	
“	“	experience leads to anticipation	
“	“	“that’s not something that you teach in school”	
“	“	“you can tell...when trouble’s coming”	

Category	Focused	Open	Paradigm
“	“	“You learn from your mistakes”	
“	“	“you learn something every time”	
“	“	“you try to plug this square peg in a round hole”	
“	“	acknowledging inexperience	
“	“	developing a multidimensional view	
“	“	early experiences	
“	“	experience as a requirement for employment	
“	“	experience helps to avoid tunnel vision	
“	“	experience not a help	
“	“	Experience serves as a guide	
“	“	lacking experiences	
“	“	necessity for a particular type of experience	
“	“	pattern recognition	
“	“	relying on past experience	
“	“	“So, that’s one thing I put in the back of mind for next time”	
“	“	“there’s something new every day”	
“	“	using experience for comparison	
“	Experience Helps		
“	“	acknowledging differences in experiences	
“	“	“double the amount of education”	
“	“	“I think it’s one of the biggest aspects of it all”	
“	“	“Like a flashover. There’s nothing that you can read that can prepare you for that”	

Category	Focused	Open	Paradigm
Handling Information	“	“because you’ve got to get it everywhere”	Action/ Interaction/ Emotion
“		information overload	
“		conflicting or changing information	
“		confusing updates	
“		considering the information needs of others	
“		dealing with the news media	
“		determining detail of information	
“		digging a little deeper	
“		getting patient report	
“		giving information	
“		Identifying important information	
“		incomplete information	
“		information from bystanders	
“		information from victims	
“		information relay time	
“		Information seeking - bystanders	
“		initial verbal report most useful to SA	
“		invaluable information	
“		“it’s really difficult to balance”	
“		loss of information source	
“		misinformation from patients	
“		news media as a resource	
“		obtaining inaccurate information	
“		pressuring for critical information	
“		providing updates from the scene	
“		receiving updates	
“		reporting an incident	
“		seeing a placard	

Category	Focused	Open	Paradigm
“		timing of important information	
“		unclear information	
“		where information is coming from	
“	Communicating	“the wagon wheel theory”	
“	“	using a runner	
“	“	becoming separated	
“	“	busyness reduces communication	
“	“	chain of communication	
“	“	communicating concerning patient care	
“	“	communicating to the receiving facility	
“	“	communicating non-verbally	
“	“	communicating through body language	
“	“	communicating through photos	
“	“	communicating with air evac	
“	“	communicating with patients	
“	“	communicating with the hospital	
“	“	communicating with the pilot	
“	“	communicating with the receiving provider	
“	“	communication – for better or worse	
“	“	communication as a problem	
“	“	communication style is scene dependent	
“	“	critically communicating	
“	“	dedicated to communication	
“	“	desire for clear language	
“	“	distance impairing communication	

Category	Focused	Open	Paradigm
“	“	infrastructure limiting communication	
“	“	lack of communication	
“	“	reducing response	
“	“	line of sight	
“	“	multiple means of communication	
“	“	no communications	
“.	“	not communicating for safety reasons	
“	“	PAR frequency for facility communication	
“	“	patient care is priority communication	
“	“	physical separation breaks communication	
“	“	receiving patient report	
“	“	receiving report	
“	“	relayed to the hospital	
“	“	time limiting communication	
“	“	using a landline for medical communication	
“	“	using cell phone because of terrain	
“	“	using hand signals	
“	“	working through the layers of communication	
“	Communicating/ Face to Face	face to face communication	
“	“	“you see when they’re rattled”	
“	“	face to face communication for unusual situation	
“	“	face to face preferable in large events	
“	“	preferring face to face	
“	“	“too much to say to say it over the radio”	
“	Communicating/ Radio	radio communication	
“	“	“wanting to take the radio and just pitch it out the	

Category	Focused	Open	Paradigm
		window”	
“	“	link back to help	
“	“	hesitancy to communicate	
		all information over the	
		radio	
“	“	increased traffic, decreased	
		usefulness	
“	“	limitations to radio	
		communications	
“	“	little radio traffic means a	
		bad scene	
“	“	multiple radio channels	
“	“	one radio per crew	
“	“	patient care is priority	
		communication	
“	“	radio updates	
“	“	required but frustrating	
		information	
“	“	using dedicated scene radio	
		channel	
“	“	volume of traffic decreases	
		awareness	
“	Initial	1077	
	Information		
“	“	chain of communication	
“	“		
“	“	“It was going to go to our	
		south”	
“	“	“it was like a domino	
		effect”	
“	“	receiving initial	
		information	
“	“	receiving the call	
“	“	still alarm (In Vivo, not	
		dispatched)	
“	“	the call came in	
“	“	the tones went off	
Insuring Safety		don’t rush in	Condition
“		experience impacts scene	
		safety	
“		safety of all is the priority	
“		“scene safety is the first	
		priority”	

Category	Focused	Open	Paradigm
“		“there is no balance”	
“		“a perfect LZ”	
		acknowledging limitations	
“		assessing risk and benefit	
“		careful response	
“		commanding the LZ	
“		considering risks	
“		Considering risks to providers	
“		de-escalation for safety	
“		designated to find a safe LZ	
“		facing impaired people	
“		landing upwind	
“		looking for hazards	
“		“make sure everyone’s going home at the end of the night”	
“		making the scene safe	
“		managing the scene well	
“		pairing up	
“		personnel safety	
“		physical obstacles posing risks	
“		removing those involved to safety	
“		risk of violence	
“		risk to safety	
“		scene safety	
“		secure LZ	
“		self protection	
“		stabilizing the scene	
“		starts with dispatch	
“		“stop any further damage”	
“		taking risks for patient care	
“		“three to go, one to say no”	
“		“two in, two out policy”	
“		unusual LZ	
“		“we both knew it was time to get out”	
“		“we gotta take care of ourself”	
“		“we’re gonna make sure	

Category	Focused	Open	Paradigm
		that people are gonna be safe"	
"		"we'd be more at risk if we pulled up at the scene and waited before we went it"	
"	New Threats	"the times are not the same"	
"	"	"the world is not the same today"	
"	"	considering new threats	
"	"	contaminated patients	
"	"	"a lot of hybrid cars have 400 DC volts that run through them"	
Interval Action			Condition
"		political ramifications	
"			
"		"you honestly think they're gonna expose a problem with their cash cow"	
"		being ready for a busy night	
"		educating responders	
"		formal education	
"		inter-agency training	
"		pre-action planning	
"		teaching LZ classes	
"		training together	
"		very little training	
"	Interval/ Proximal	after-action contemplation	
"	"	culture impacting debriefing	
"	"	culture impacting debriefing	
"	"	discouraging younger responders from attending debriefing	
"	"	informal crew training	
"	"	questioning yourself	
"	"	encouraging younger responders to attend debriefing	

Category	Focused	Open	Paradigm
Managing Resources	“	critiquing and debriefing “I am not a helicopter advocate myself”	Action/ Interaction/ Emotion
	“	“like Custer calling for more Indians”	
	“	political ramifications	
	“	arriving resources	
	“	assessing resource needs	
	“	assessing resources	
	“	automatic number of resources sent	
	“	basing resource needs on visual cues	
	“	being dispatched early	
	“	being placed on standby	
	“	calling additional resources early	
	“	calling on the untrained	
	“	cancelling responders	
	“	capability affecting resources	
	“	considering medical air evacuation	
	“	criteria checking	
	“	criticality of patients	
	“	deploying resources	
	“	dispatchers aiding with resource needs	
	“	distributing resources	
	“	financial implications of response	
	“	following protocol for response	
	“	getting trained	
	“	professionals to the scene	
	“	help arriving	
	“	improving resources over time	
	“	limited resources	
	“	limited time and resources	
	“	“make sure they have all the resources they need”	

Category	Focused	Open	Paradigm
		manpower usage	
		match the command	
		feature with the resources	
		news media as a resource	
		obtaining resources	
		overwhelming the	
		resources	
		redirecting resources	
		requesting additional	
		resources	
		resource coordination	
		resource utilization	
		assessment	
		staging of resources	
		“they were so outnumbered	
		that.....you had to laugh	
		about it”	
		utilizing all available	
		resources	
		varying resource response	
		“we took it off the aircraft	
		just to make it lighter”	
	Time		
	Management		
	“	“I built a timeframe”	
	“	“time kinda gets skewed	
		when you’re in the middle	
		of that”	
	“	“we’ve got twelve	
		minutes”	
	“	“an eight minute flight	
	“	comparing transport time	
	“	considering time	
		management	
	“	considering transport time	
	“	“less than twenty minutes	
		from initial dispatch to at	
		the patient’s side”	
	“	time alteration	
Patient Care			Consequences
		avoiding tunnel vision	
		staying on the scene	
		changing tactics based on	

Category	Focused	Open	Paradigm
“		equipment	
“		concerns for abandonment	
“		criticality creating	
“		insecurity	
“		having tunnel vision	
“		not knowing the outcome	
“		second-hand information	
“		tallying the injured	
“		the emotional toll	
“	Patient Disposition		
“	“	transporting patients in a truck	
“	“	acknowledging the proximity and capability of the receiving facility	
“	“	considering location relate to facility	
“	“	deciding on transport	
“	“	determining disposition	
“	“	determining the facility by air	
“	“	extraneous factors make a difference	
“	“	injuries limiting disposition	
“	“	matching facilities to patients	
“	“	patient transport considerations	
“	“	patients transporting themselves	
“	“	policy limiting disposition	
“	“	preparing for transport	
“	Providing Care		
“	“	acknowledging victim’s loss	
“	“	additional help	
“	“	assessing the patient	
“	“	avoid missing anything	
“	“	being empathetic	
“	“	care interrupted	
“	“	changing status of patient	
“	“	delegating patient care	

Category	Focused	Open	Paradigm
“	“	determining who is a patient	
“	“	difficulty dealing with victim’s loss	
“	“	distraught family	
“	“	obstructing patient care	
“	“	determining patient condition	
“	“	diagnosing	
“	“	“do what you need to do”	
“	“	documenting patient care	
“	“	discontinuing care	
“	“	equipment impairing patient care	
“	“	extricating the patients	
“	“	identifying the location of patients	
“	“	initiating care	
“	“	juggling multiple patient care considerations	
“	“	locating victims	
“	“	medical knowledge of first responders affecting subsequent care	
“	“	mechanism of injury	
“	“	patient care by the highest level of training	
“	“	patient care inhibiting SA	
“	“	“patient care is always a priority”	
“	“	patient refusing treatment	
“	“	prioritizing for transport	
“	“	providing care at a distance	
“	“	providing initial care	
“	“	providing reassurance	
“	“	reassessing patients	
“	“	recognizing patient care as a priority	
“	“	releasing care	
“	“	seeking medical advice	
“	“	searching for victims	
“	“	stabilization before transport	

Category	Focused	Open	Paradigm
“	“	taking risks for patient care	
“	“	“the care was my primary concern”	
“	“	“there’s no extra space”	
“	“	transfer of care	
“	“	treating injuries	
“	“	“to identify the mechanism of injury takes all of 15 seconds”	
“	Triaging		
“	“	“about as critical as it gets”	
“	“	unique triage situation	
“	“	“you’ve gotta move on”	
“	“	determining the number of patients	
“	“	establishing acuity of injuries	
“	“	MCI altering triage	
“	“	number of patients	
“	“	number of responders	
“	“	affecting triage	
“	“	questioning the triage of other providers	
“	“	triage and treatment	
“	“	understanding the need to triage	
“	“	using visual cues for triage	
“	“	“you save the ones you can”	
Recognizing Roles and Relationships		“bring out more of the nurse”	Condition
“		EMS training enhancing nursing knowledge	
“		“most of us gonna know each other on a first name basis”	
“		working with those personally known	
“		improves response	
“		acknowledging the roles of others	
“		camaraderie improving function	

Category	Focused	Open	Paradigm
“		commanding the LZ	
“		conditions that change the	
		priority	
“		conflicting responsibilities	
“		conflicting roles	
“		decreasing efficiency	
“		difficulty identifying	
		responders	
“		difficulty of being in	
		charge	
“		doing assigned job	
“		dual role leading to prima	
		donna attitude	
“		embracing unusual roles	
“		evidence preservation	
“		flight crew responsibilities	
“		hoping they can handle it	
“		“I responded as a group”	
“		“I think it makes it more	
		congenial”	
“		“I was now a witness”	
“		“it’s almost like a	
		choreographed play	
		or....dance”	
“		“it’s kind of like a	
		brotherhood”	
“		knowing those you work	
		with	
“		personnel requirements	
“		policing the media	
“		recognizing the need for	
		other agencies	
“		“so it’s not only am I	
		friends with them, these are	
		like my extended family”	
“		“they just try and take	
		over”	
“		“ I was trained paramedic	
		first, nurse second”	
“		trusting the actions of	
		others	
“		utilizing non-medical	
		personnel	

Category	Focused	Open	Paradigm
“		varying levels of training	
“		“we know each other by – on a first name basis”	
“		“we really truly need to be robotic”	
“		working together builds trust	
“	Bystanders		
“	“	being suspicious of bystanders	
“	“	bystander assistance	
“	“	bystanders acting alone	
“	“	Bystanders as a hindrance	
“	“	bystanders obstructing information gathering	
“	“	bystanders will tell you different things	
“	“	conditions dictating the use of bystanders	
“	“	conflicting information from bystanders	
“	“	crowd control	
“	“	depends on the situation	
“	“	hesitancy in using bystanders	
“	“	perception of bystanders	
“	“	prayer by a bystander	
“	“	receiving help from bystanders	
“	“	“the best help you’ll ever find or bothersome”	
“	“	that was his role	
“	“	threatening bystanders for information	
“	“	verifying credentials	
The Human Factor		“a learned.... skill”	Action/ Interaction/ Emotion/ Consequences
“		“a lot of people who drink a lot”	
“		becoming angry	
“		“”Cause it will hurt you”	

Category	Focused	Open	Paradigm
“		“I clicked into a mode”	
“		“I remember being tearful afterwards”	
“		“I tend to compartmentalize them until later”	
“		“it required some restraint”	
“		“one must lead the troops”	
“		perception of a hero	
“		“you remember everything about that patient”	
“		“you try to block it out”	
“		acknowledging death	
“		“and you cry a little, um and then you have the big debriefing with the chief”	
“		being offered debriefing	
“		Being uncomfortable with debriefing	
“		dealing with your emotions	
“		difficult to avoid rushing in	
“		empathizing with family	
“		environmental and social interaction	
“		establishing detachment	
“		expressing concern	
“		feeling pressure	
“		fighting gut instinct	
“		getting too close	
“		“I needed to be in there hands on”	
“		“ I remember feeling shocked”	
“		“it kind of kicked me into a higher mode to hurry and do something”	
“		keeping an emotional distance	
“		not being able to do it by the books	
“		“you’re obviously playing mind games”	
“		“that really bothered us”	

Category	Focused	Open	Paradigm
“		“the human factor to this certainly was the five year old”	
“		“they could hurt you”	
“		wanting to help	
“		wanting to know	
“		“wanting to take the radio and just pitch it out the window”	
“		“you cry about it after the call”	
“		“you have to step above that”	
“		“you just kind of flip the switch”	

Vita

Steven Busby was born in Tampa, Florida on July 23, 1962. He graduated from King High School in May of 1980. He earned educational certificates and was state certified as an emergency medical technician (EMT) and later as paramedic and worked in emergency medical services (EMS) from 1985 to 1992 in the Tampa Bay area. In 1992, he earned dual associate degrees in Nursing and EMS education and began his career as a nurse at Flowers Hospital in Dothan, Alabama. He worked as a nurse in the cardio-vascular intensive care unit and also worked in the emergency department and as a hospital educator. He earned a Bachelor of Science in nursing from Troy State University in May of 1996. In December of 1997, he graduated with a Master of Science in nursing from the University of South Alabama and worked in both a private primary ambulatory care office and the emergency department as a family nurse practitioner.

In August of 2003, he accepted a full-time faculty position at the University of Alabama in Huntsville where he currently works and is coordinator of nurse practitioner programs. Steven began his doctoral studies at the University of Tennessee in Knoxville in fall of 2006. His area of study was the new and emerging area of Homeland Security Nursing. He received his PhD in nursing with a Homeland Security Nursing specialty in August of 2009. He is currently a member of the federal National Disaster Medical System (NDMS) and serves as a nurse practitioner on the Alabama 1 Disaster Medical Assistance Team (DMAT).