

**THE STORIES WE TELL: ORGANIZING FOR VICARIOUS LEARNING IN AIR
MEDICAL TRANSPORT TEAMS**

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Abstract

Vicarious learning, an individual's learning from others' experiences, has long been recognized as an important component of learning in organizations. Yet, prior research has focused primarily on the introduction of structures and conduits for this learning (e.g., knowledge management systems, personnel rotation, or communities of practice), to the exclusion of examining the interpersonal interactions occurring within these conduits and how they coalesce with formal and informal structures in the enactment of vicarious learning. Drawing from an observational and interview study of air medical transport teams, I inductively build a multi-stage process model of how individuals *organize* for vicarious learning, emphasizing interpersonal storytelling interactions as a key site of vicarious learning, while also attending to how individuals use formal structures and emergent practices to enable, enact, and elaborate these vicarious learning interactions. Specifically, this organizing model highlights the role of context in bounding and triggering vicarious learning interactions and articulates mechanisms through which different structures and practices enable (by building capacity and increasing heedful interrelating) and elaborate (by constructing routines and facilitating transfer) the learning from these interactions. I conclude by discussing the implications of this organizing model for both the study and practice of vicarious learning in organizations.

Introduction

“You really never know what you are going to get into. We don’t fly just the average patient; we fly very very sick patients ... We may be going on an ICU to ICU for a patient who is in liver failure [or] if you are going on a scene call and it’s just trauma, you have to be able to manage that patient... We are constantly learning [so that we’re ready to handle these cases].

A Flight Nurse, describing the challenges of preparing for the uncertainty and complex nature of air medical transportation

Individual learning – the process by which experience alters one’s beliefs or behavior (Argote, 1999; Bresman, 2013) – has long been regarded as critical for employee (Colquitt, LePine, & Noe, 2000), team (Edmondson, 1999), and organizational success (March, 1991). Yet, in an era of ever-more complex, interdependent and diverse workplace experiences, where individuals are more likely to encounter unusual or unique work demands (Cascio, 2003), learning based solely on individuals’ own experience may falter (Garud, Dunbar, & Bartel, 2011; Morris & Moore, 2000). In contrast to prior work eras, employees are increasingly experiencing the kind of work described in the opening quote (from a member of an air medical transport team – teams of clinicians who transport patients from a small hospital or accident scene to receive critical care at a larger hospital), where “you really never know what you’re going to get into” (see also Sanchez, 1994). In these contexts, developing expertise from an accumulation of similar prior experiences is insufficient, as tasks require broad and diverse knowledge (i.e., not only expertise in a particular function), making it unlikely that any one individual will have direct prior experience in all necessary areas for accomplishing the task (e.g., Sullivan, 1999).

Recognizing this limitation of learning only from one’s own direct experiences, employees increasingly rely on more vicarious learning (where *others’* experiences alter one’s beliefs or behavior), allowing them to use the lessons of others’ experiences in order to develop the requisite variety (Weick, 1979) necessary to meet dynamic work demands within their organization. As Bandura (1977, p. 22) summarizes, “learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do.” Accordingly, engaging in vicarious learning has been shown across a

number of domains to reduce inefficiencies and improve performance (Argote, Beckman, & Epple, 1990; Argote, Gruenfeld, & Naquin, 2001; Kim & Miner, 2007; Szulanski, 1996). Though much of this research has been conducted at the organizational level of analysis (examining how organizations use the experience of other firms to enhance their own learning and performance; e.g., Huber, 1991; Madsen & Desai, 2010; Ancona & Bresman, 2007; Haunschild & Miner, 1997;), significant attention has also been paid to understanding the structures and practices that promote individual learning from others within organizations (see Bresman, 2013).

Examining this within-organization vicarious learning, research frequently points to formal structures and knowledge transfer conduits as critical. It was long assumed that knowledge sharing was simply a natural function of the workplace, occurring “automatically” (see Ipe, 2003), but scholars and practitioners have increasingly come to see the structuring of resources in the learning environment as necessary for knowledge sharing (e.g., Siemsen, Roth, Balasubramanian, & Anand, 2009). In this view, knowledge resides in multiple reservoirs within a unit or organization and is transferred through structured linkages (conduits) between these various reservoirs (Argote & Ingram, 2000). For instance, organizations can use knowledge management systems to create repositories of prior practices and knowledge for storage and future retrieval by others (Alavi & Leidner, 2001; Fahey & Prusak, 1998; Matzler & Mueller, 2011), or can employ formal practices of personnel rotation – moving individual employees between different teams, units, or subsidiaries to facilitate the sharing of knowledge, insights, and innovation (Kane, 2010; Kang, Morris, & Snell, 2007; O’leary, Mortensen, & Woolley, 2011).

Yet, despite the identification of these potential structural conduits for vicarious learning, our understanding of how people learn from one another in organizations is still quite limited, as a process-oriented, micro-level view of how people create, adapt and make use of these conduits remains largely omitted from prior research (Bresman, 2013; Darr, Argote, & Epple, 1995; Styhre, Ollila, Roth, Williamson, & Berg, 2008). In other words, the focus of prior work has

been on the simple presence or absence of learning conduits, rather than on what unfolds between individuals within these conduits. This omission is problematic, as sharing knowledge and experience in modern organizations has been identified as a complex, multifaceted process (Wang & Noe, 2010), and simply investing in the creation of potential knowledge conduits (such as implementing a knowledge management system) does not always enhance interpersonal learning (see Gupta & Govindarajan, 2000; Matzler & Mueller, 2011; McIver, Lengnick-Hall, Lengnick-Hall, & Ramachandran, 2013).

Contrasting this focus on formal learning conduits, a separate stream of research has viewed this vicarious learning as situated in more informal, less technical processes and practices within organizations (see Contu & Willmott, 2003; Hazlett, McAdam, & Gallagher, 2005). In particular, prior research has explored the impact of “communities of practice” (Brown & Duguid, 1991), relatively informal groups of practitioners who gather – either in person or via a virtual community (e.g., Ardichvili, 2008; Chiu, Hsu, & Wang, 2006) – to share knowledge and best practices learned through experience (Orr, 1996). Individuals are viewed as learning from others’ experiences through increased engagement in work tasks and “fuller” participation in the community (i.e., moving from the periphery to the core of the community; Lave & Wenger, 1991). However, as with the literature on formal conduits, research on communities of practice has also largely ignored the underlying interpersonal interactions that constitute this vicarious learning, assuming that learning occurs unintentionally through a general process of socialization into the community (i.e., attending less to the dynamics of the actual interactions, or the construction of specific teaching-learning relationships; Bailey & Barley, 2011).

Integrating these two streams of research thus reveals that, despite the identification of potential sites of vicarious learning, we still know relatively little about how vicarious learning is actually enacted at the interpersonal level within these formal conduits or informal communities of practice. Indeed, several scholars have noted that “organizational learning research using the term vicarious learning has been agnostic about the activities by which it occurs” (Bresman, 2010, p. 93), and that “a greater understanding of the micro processes underlying the transfer of

knowledge is needed” (Darr et al., 1995, p. 1761). At the same time, reviewing these competing research paradigms – one advocating formal transfer structures and the other highlighting informal learning practices among community members – also reveals two largely disparate approaches to promoting individuals’ learning from others’ experiences with little understanding of how formal structures and informal practices might both simultaneously influence individuals’ enactment of vicarious learning at work (although see Thompson, 2005 for a discussion of the role of organizational structure in the formation and dissolution of communities of practice). This lack of understanding is problematic, particularly in light of the long-standing view that work processes (such as learning) are jointly dependent on formal *and* informal elements of the organization (McEvily, Soda, & Tortoriello, 2014). The field is thus in need of understanding regarding both the underlying interpersonal micro-processes by which individuals enact vicarious learning in organizations, as well as how formal structures and informal practices interact with these interpersonal processes to impact learning.

The Present Research: Organizing for Vicarious Learning

In light of these two needs, what seems missing is a perspective on how individuals *organize* for vicarious learning at work. Weick (1979, p. 11) defines organizing as a process of “resolving of equivocality in an enacted environment by means of interlocked behaviors embedded in conditionally related processes,” explicitly calling attention to the simultaneous interplay of practices (interlocked behaviors) and structures (conditional processes) in the interpersonal processes individuals employ to make sense of events and enact this sense back into the world (Weick, Sutcliffe, & Obstfeld, 2005). Indeed, an organizing perspective is inherently attuned to both informal practice and formal structure, as it involves individuals sharing their varying, distributed experiences through interpersonal interactions, which are then incorporated into collective understandings and routines that inform future experiences (e.g., Christianson, Farkas, Sutcliffe, & Weick, 2009; Garud et al., 2011; Weick & Sutcliffe, 2007). Moreover, a focus on organizing emphasizes a process-oriented view of vicarious learning,

placing its focus on the interpersonal interactions and discourse occurring between individuals as they make sense of one another's experiences (i.e., emphasizing ongoing actions, rather than the simple presence or absence of conduits). Focusing on how individuals organize for vicarious learning thus provides a means for addressing the needs identified above, helping develop a clearer understanding of the processes by which individuals learn from others' experiences at work (while also answering recent calls for more in-depth, meso-level research on learning practices in organizations; Noe, Clarke, & Klein, 2014).

Developing this clearer understanding offers a significant contribution to theories of vicarious learning in organizations by providing a process model of how individuals learn from one another's experiences in dynamic, knowledge-intensive organizational contexts. Prior theories emphasizing vicarious learning as occurring through formal conduits for replicating successful practices (with less attention to the underlying interpersonal actions) were likely fueled by the high-volume manufacturing organizations that dominated the time of their introduction (Tucker & Edmondson, 2007), where large-scale imitation of successful practices within and across plants was achievable with the mere introduction of a knowledge-sharing conduit. However, the social context of learning in organizations has changed dramatically over time (Noe et al., 2014), moving away from easily replicable assembly line work tasks (Bailey & Barley, 2011; or the pre-industrial production models often invoked in theories of situated learning and communities of practice; Gherardi, 2006) to more service-oriented, interdependent work environments requiring greater social coordination, more interpersonal interaction, and transmission of tacit knowledge (Tucker, 2011). In these environments, a robust theory of vicarious learning requires consideration of not only the presence or absence of various conduits and communities for learning, but also of the actions individuals take as they engage in interpersonal processes of interaction and reflection (Daft & Weick, 1984; Garud et al., 2011; Weick, 1995) to learn from others' experiences. Whereas early approaches to studying vicarious learning in organizations relied on a largely intrapersonal mechanism of observing and imitating the behavior of "models" (e.g., Bandura, 1986; Gioia & Manz, 1985), more recent theorizing

emphasizes a coactive mechanism of vicarious learning, where individuals co-create an understanding of their experience through reciprocal discourse (Myers, 2015). Extending this perspective, an organizing perspective explores how these discursive interactions unfold in organizations.

It is this unexplored question of how people organize for vicarious learning that I seek to examine in this paper. Drawing from a comparative qualitative study of two air medical transport teams, I inductively build an understanding of the interpersonal process of vicarious learning, as well as the interplay between informal practices and formal structures in the enactment of this learning. Members of air medical transport teams face a work context where experiences are both scarce and diverse (i.e., they are unlikely to obtain direct experience treating every possible injury or illness they might face), and where the need for reliable performance is high (Weick & Sutcliffe, 2007), weakening their ability to rely on direct experiential learning (e.g. “trial and error” learning) as a means of developing and improving their performance. As a result, these team members benefit from efforts to vicariously learn from their colleagues’ experiences, as a tool for sensemaking and navigating the uncertainty and complexity of medical work (Hofmann, Lei, & Grant, 2009; Tucker & Edmondson, 2003; Weick et al., 2005). Yet this need for organizationally-embedded vicarious learning is not limited to the healthcare field, as many industries face dynamic environments where employees may have differing experiences that can inform one another’s learning, and where “reinventing the wheel” has substantial costs (Argote & Ingram, 2000; Bresman, Birkinshaw, & Nobel, 1999). Therefore, though the context of air medical transportation can be seen as a somewhat “unconventional” research setting for a study of these organizing processes, the potential impact of learning from others’ experiences (and the consequences for failing to learn) in this environment throw into sharp relief the actions and structures that facilitate vicarious learning, allowing me to capture “constructs and relationships that may be too weak to notice or capture in traditional settings, thus facilitating the development of rich theory” (Bamberger & Pratt, 2010, p. 668) and answer recent calls for rich, qualitative investigations of knowledge work in modern organizations (i.e., Bechky, 2006).

Drawing my analytical lens from theories of organizing (e.g., Weick, 1979), I focus on the interactions individuals use to share their experiences with one another in air medical teams, and in particular on storytelling interactions (i.e., sharing narratives of prior experience; Boje, 1991; Pentland, 1999) as a key interpersonal site of vicarious learning. I then explore how individuals in these teams use various pre- and post-interaction structures and practices to organize their work in support of vicarious learning interactions, advancing a three-stage process of enabling, enacting, and elaborating vicarious learning. I thus challenge and extend theories of vicarious learning by introducing a process-model of the interpersonal interactions that constitute vicarious learning (absent from prior theories), while also detailing the role of formal structures and informal practices in organizing the work environment to support vicarious learning.

Methods

Scholars have long established that “how” questions are well-suited to qualitative research methods (Lee, Mitchell, & Sablinski, 1999; Yin, 1989), particularly where little theory exists to guide an investigation (Edmondson & McManus, 2007), as is the case with research on vicarious learning (see Bresman, 2013). Given that organizing involves the development and understanding of a shared action emerging from the interplay between individuals’ deliberate behavior and creation of structures, qualitative methods can address the full range of the phenomenon, as they lend themselves to exploring individuals’ meaning-making (i.e., centering on the participants’ perspective) while also capturing the dynamics of the context – exploring a phenomenon in its natural setting (Maxwell, 2005). I thus explore my research question using an inductive, qualitative study of air medical transport teams, relying on both participant observation and interview methods. Indeed, consistent with recent views of vicarious learning as a process of individual belief and behavior change emerging from a discursive interaction and coactive processing of another’s experiences (e.g., Myers, 2015), assessing whether or not learning occurs involves examining both observable practices and structures (e.g., discussion or opportunities for reflection; Edmondson, 1999) as well as individuals’ self-perceptions of growth

and development (e.g., Sonenshein, Dutton, Grant, Spreitzer, & Sutcliffe, 2013), suggesting that qualitative methods such as observation and interviews would be appropriate.

Research Setting

I conducted a qualitative investigation of vicarious learning in the context of air medical transport teams – teams of healthcare providers that work in pairs to transport patients via helicopter (or occasionally fixed-wing aircraft or ambulance) from smaller hospitals or accident scenes to a large, tertiary-care center with greater capacity to care for the patient’s injuries or illness. Following the logic of theoretical sampling (Eisenhardt, 1989), the healthcare context provides a useful setting for examining my research questions relating to individuals’ vicarious learning efforts. Healthcare providers face a context of rapid advances in knowledge, coupled with highly complex and uncertain work (Tucker, 2011). This need to keep up with complex, ever-changing knowledge, and the uncertainty about exactly how to apply that knowledge to any given patient (i.e., due to variability in the presentation of a particular disease) creates a context where continuous learning is a necessity, and where learning from others’ experiences can be particularly helpful. Indeed, in the specific context of air medical transportation, beyond just providing rapid transportation, pairs of providers treat a patient’s condition to the best of their ability en-route, requiring that they be willing and able to make decisions that have a significant impact on patients’ outcomes. By definition, the cases that air medical teams are called upon to transport are relatively infrequent and typically non-routine, as patients with more routine injuries or illnesses (i.e. ones that are more common or easily cared for) are typically treated in a smaller hospital facility or transported by a ground ambulance team. As a recent medical review of air medical transportation notes, the average patient transported by helicopter is more severely injured and requires more medical resources than a patient transported by ground ambulance (Desmettre et al., 2012), presenting air medical providers with a high level of complexity and uncertainty, which has been shown to lead medical professionals to seek advice and learn from others (e.g., Hofmann et al., 2009).

This degree of complexity and diversity, combined with a need for highly reliable performance (e.g., Leape, 1994; Rosenthal & Sutcliffe, 2002; Weick et al., 2005), makes it difficult for air medical team members to learn everything they need to perform effectively from their own direct experience, and thus makes air medical transport teams an ideal case in which to observe vicarious learning. Indeed, discussing when vicarious learning might occur, Bandura (1977) specifically identifies surgery (and other medical procedures) and flying an aircraft as examples of critical contexts wherein relying solely on an individual's own pattern of success or failure experiences for learning would be quite limited. Given that air medical transportation encapsulates both of these task conditions, it is an ideal industry in which to examine how individuals organize to support effective vicarious learning.

Research sites. The primary site for my research was Sigma Flight,¹ an air medical transport team affiliated with a large university-based tertiary care hospital in the Midwest United States. I gained access to the site through contact with the team's manager and medical director, and was afforded complete access to the team's operations, allowing me to gather the detailed, rich data necessary to address my research questions. Sigma Flight transports approximately 1,300 cases per year, with a mixture of inter-facility transports (moving patients from smaller community hospitals to their respective university-based hospital) and scene transports (responding directly to the scene of a serious accident). The team transports patients using both rotor-wing (helicopter) and fixed-wing (jet plane) aircraft, with two helicopters in service at two different base locations 24 hours per day. Most transports are flown in the helicopters, with the fixed wing aircraft available on standby for longer transports. The helicopters are staffed with two flight nurses (who are both also certified as paramedics), in addition to the pilot (an employee of a third-party aviation vendor) and occasional "third riders" such as resident physicians or other specialists. The program employs approximately 20 flight nurse/paramedics (who make up what I will refer to as the "flight team members"). In addition to

¹ All names of individuals and organizations are pseudonyms.

these flight team members, Sigma Flight employs a number of communication specialists who operate the dispatch center (where flight requests are received from outside hospitals and EMS agencies), as well as mechanics for the aircraft (also employed by the third-party vendor). Flight team members work twelve-hour shifts at one of Sigma Flight's bases with a partner, and respond to any flight requests sent through the dispatch center during that time. A shift typically involves spending a significant portion of time in the flight office, completing paperwork on prior transports, working on continuing education requirements, discussing prior cases, practicing techniques, as well as eating and resting. Shifts involve two flight requests on average, which can come at anytime, and require immediate response from the flight team.

Flight team members are called upon to transport a broad spectrum of patients – ranging in age from newborns to the elderly, and covering a wide range of diagnoses – and fly many of the most difficult cases, which others (e.g., ground ambulance teams) are unable to transport, due to lack of equipment, training, and expertise. This puts a significant amount of pressure on individual team members to learn and stay current on a wide range of techniques, medications, and treatment methods, as well as to be proficient in their use and application for differing patient populations. As a way of meeting these broad learning demands, Sigma Flight utilizes a generalist staffing structure, requiring that all flight team members be dual-licensed as both a nurse and a paramedic (rather than one or the other), and also engages in deliberate learning practices, such as weekly “grand rounds,” where cases transported in the previous week are reviewed by the program's flight team members, education coordinator and medical director.

After evaluating the initial qualitative data stemming from my research at Sigma Flight, I decided to gather data from a second site, in order to complement and refine my understanding of the vicarious learning processes observed at Sigma Flight. This second air medical program, Gamma Flight, operates the same number of bases and aircraft as Sigma Flight, and flies a similar volume of transports, although it is located in a separate state, and thus is not a direct competitor of Sigma Flight. Gamma Flight is affiliated with a university-based tertiary care hospital in the Southeast United States, and engages in many of the same operations as Sigma

Flight. I obtained access to Gamma Flight after being embedded in the Sigma Flight context, through a personal contact between the managers of each program. Though similar in their operations and flight volume, Gamma Flight differs from Sigma Flight in a few respects. Gamma Flight team members work twenty-four hour shifts at one of the program's two bases, and gather for staff meetings and case review only once per month (in contrast to Sigma Flight's weekly grand rounds). Most notably, Gamma Flight team members are typically licensed as either a flight nurse or paramedic (in contrast to Sigma Flight's dual-licensed staff), and Gamma Flight uses a separate, specialized team to transport pediatric patients, consisting of a nurse and respiratory therapist (in contrast to Sigma Flight's use of generalist teams to transport patients across the age spectrum). I draw on this variance in practices across my two research sites to develop a more nuanced understanding of the process of vicarious learning and refine the theory emerging from my inductive analysis (Eisenhardt, 1989; Yin, 1989). In this way, my choice of these two research sites was both theoretical and purposive, reflecting a deliberate effort to observe varying practices across two different settings (to refine the precision of my theorizing), within an industry context where vicarious learning is particularly impactful.

Data Sources

Following widely-accepted recommendations for grounded theory development (Barley, 1990a; Eisenhardt, 1989; Miles & Huberman, 1984) and recent examples of such theory development, particularly in medical contexts (e.g., Edmondson, Bohmer, & Pisano, 2001; K. J. Klein, Ziegert, Knight, & Yan, 2006), I explored individuals' organizing processes of vicarious learning utilizing several overlapping data sources. Specifically, I conducted participant observation and informal discussion (across two distinct phases) at both Sigma Flight and Gamma Flight, as well as a third phase of semi-structured interviews with team members from each site, accompanied by analysis of archival materials. By triangulating insights from these overlapping data sources, I am able to improve the validity of my theorizing (Eisenhardt, 1989; Jick, 1979; Yin, 1989).

Observation and informal discussion. The first source of data involved participant observation of Sigma Flight and Gamma Flight teams as they perform their daily work routines, gathered in two distinct phases. Observational methods allow researchers to study people as they engage in repeated organizational practices, which can facilitate an understanding of changes in behavior or thought (Engeström & Middleton, 1998) making it an ideal method for understanding learning (as a process of altering through or behavior as a result of an experience; Kolb, 1984). In the first phase of data collection, I conducted approximately 200 hours of shift observations at Sigma Flight, accompanying a given pair of team members as they completed their entire 12-hour shift (although my observation periods often ran for 14 hours or more, to include the arrival of the team and handoff from the prior shift, and to accommodate “late flights” that extended beyond the anticipated shift end). I immersed myself in the research setting by observing a variety of shifts, spanning day and night shifts, weekday and weekend shifts, and shifts at both bases, in order to obtain a representative understanding of the experience of flight team members. During these shifts, I accompanied team members through their daily routine, including their shift briefings, discussions, “downtime,” and other activities (e.g., meals), as well as accompanying them on flights. During the treatment and transport of the patients, I observed from a few feet away from the patient’s side (while we were in a hospital or at an accident scene), and sat alongside the crew during transport in the helicopter or jet aircraft, observing as they treated the patient. When not transporting a patient, I frequently engaged in conversations with team members, which enhanced my understanding of the setting and the events unfolding, and also served as opportunities to engage in informal interviewing.

Throughout my observations and informal interviewing, I took written notes, which I later converted into detailed field notes, including quotations from conversations with and among the flight crew (which I recorded verbatim in my notes whenever possible; Emerson, Fretz, & Shaw, 1995; J. Lofland, Snow, Anderson, & Lofland, 2006). My presence as an observer did not seem to alter the behavior of the team, as they were used to having a “third rider” along on their flights, because of their university hospital’s program for medical residents to fly along with the

team. During these transports (as well as at other points), I assisted the crew with simple tasks, such as carrying equipment or preparing minor documents, which facilitated greater trust and understanding between myself and the crew, reducing the potential tension of being observed while also creating opportunities to inquire about what was going on. Indeed, as Michel (2007) has noted, participating in the work of a team allows the researcher to ask detailed questions that would be disruptive if coming from an observer, as the researcher is embedded in the task itself, and so work-process questions fit more naturally into expected communication.

In addition to this observation of team members during their shifts, I also observed a large number of Sigma Flight's weekly "grand rounds" meetings, totaling approximately 125 hours over a period of two years (both during and after my non-participant observation of flight shifts). As with my shift observations, I used these meetings as an opportunity to not only observe, but also to engage in unstructured, informal discussions with team members, which I recorded in my field notes and include in my analysis.

In a second phase of data collection, which took place approximately 18 months after my shift observations with Sigma Flight, I engaged in similar non-participant observations at Gamma Flight. Scholars have recommended taking a break in between major rounds of qualitative data collection, in order to allow reflective time and distance that help to identify themes and gaps in understanding (Barley, 1990b). Over a period of several months, I accompanied Gamma Flight team members on their shifts, logging approximately 100 hours of observation, including transport of patients, "downtime" between flights, and other informal activities (e.g., meals, restocking equipment, etc.), following the same procedures as at Sigma Flight. I again used my role as an observer to engage team members in informal conversations, and collected my observations and quotes from these conversations in detailed field notes.

Semi-structured interviews. In a third phase of data collection, I conducted semi-structured interviews with both Sigma Flight and Gamma Flight team members (see Appendix A for a copy of the semi-structured protocol). Given that learning is a personal, thoughtful process, utilizing interviews to generate rich descriptions from the team members themselves granted me

a window into their lived experience (Marshall & Rossman, 2010). At the same time, these rich descriptions facilitated integration of individuals' different perspectives, as well as my own observations, at both the "local" level (i.e., matching observations and interview responses of a particular individual; Eisenhardt, 1989) and the more "inclusive," abstract level (i.e., integrating different individuals' perceptions and descriptions and comparing them to existing theory; Locke, 2001). I conducted 29 semi-structured interviews, lasting 53 minutes on average, with team members from both Gamma Flight (10) and Sigma Flight (19). Team members received a small gift card for participating, and all interviews were audio-recorded and later professionally transcribed verbatim.

Archival documents. Finally, both Sigma Flight and Gamma Flight provided access to a range of internal and external documents, including training materials, job descriptions, and protocols that facilitated my understanding of learning in these contexts. Through analyzing these documents, I gathered archival evidence to help triangulate an understanding of the various structures and actions enacted to organize for vicarious learning.

Data Analysis

My interest in this study was to explore the process by which individuals organize to promote individual-level vicarious learning from others' experiences, and so my primary unit of observation was a vicarious learning interaction – an interpersonal interaction that focused on one participants' prior experience with a goal of generating lessons of the experience for future use (i.e., a learning episode; see Sole & Edmondson, 2002). I mark these interactions as having occurred through the presence of either observed practices (e.g., discussion, reflection, or feedback sharing; Edmondson, 1999) from my field notes, or individuals' own perceptions of having learned from others stemming from semi-structured interview responses (e.g., Sonenshein et al., 2013). Yet, given the emphasis in prior literature on formal structures and informal practices, I also attend to collective and structural elements in my observations and how these elements influence vicarious learning interactions. Thus, I take an inherently cross-level

approach to my analysis, using my varying sources of qualitative data to explore how the vicarious learning process unfolds through a coalescence of individual thought processes (from interviews), interpersonal interactions (from observations) and collective structures (from meetings and archival documents). Importantly, my focus in this paper is on how individuals organize in support of vicarious learning, rather than on the specific outcomes of the vicarious learning interaction itself, and thus I rely on participants' descriptions of what they learned from a particular interaction as evidence of vicarious learning (in contrast to studies of social learning in classroom settings that utilize formal assessments of individuals' learning; see Taylor, Russell, & Chan, 2005).

Following traditional approaches to grounded theory building (Glaser & Strauss, 1967), I engaged in an iterative analysis process, beginning with an open reading and review of my field notes and interview transcripts, coding passages in each text with substantive labels based on their content (i.e., without overt reference to any abstract content or perspective; Maxwell, 2005). This open coding surfaced themes in observations and responses – frequently used and important (from the participant's perspective) labels of action and behavior (Glaser & Strauss, 1967; Miles & Huberman, 1984), which I used to construct initial frameworks of understanding, reflecting my early identification of broader trends and categories derived from these open “in vivo” codes (Locke, 2001). I continued to move between the data and my emerging framework of understanding, both during my periods of observation (using insight from each observation to inform and focus my subsequent observation), as well as after each major phase of data collection (i.e., between each set of observations).

In the next step of my analysis, I integrated across my various sources of data in order to focus on theoretically relevant insights that reflect a conceptual model of the vicarious learning process (Locke, 2001; Maxwell, 2005). Specifically, I combined and compared data from each of the sources as they related to particular theoretical insights, developing a more integrative framework that revealed the connections among different emerging concepts (Corbin & Strauss, 2008). I continued this integrating process, refining my emergent theory to generate a conceptual

framework that best accounted for my data (Miles & Huberman, 1984; Strauss & Corbin, 1990). Throughout the data analysis process, I engaged in repeated discussion with key informants at both Sigma Flight and Gamma Flight, who verified and reinforced my emerging interpretations (Glaser & Strauss, 1967; Pratt, 2000).

Findings

The findings of my qualitative exploration of vicarious learning in these air medical transport teams revealed a nuanced, multi-stage process model of vicarious learning, where interpersonal interactions served as a primary site of team members' learning, and further demonstrated that these interactions are situated in organized practices and structures, rather than occurring haphazardly or "automatically" (Ipe, 2003). Indeed, these findings demonstrated that individuals engaged in interpersonal storytelling (Boje, 1991; Orr, 1996) as a mechanism for learning, but that the impact of these interactions was dependent on contextual cues, and was supported by pre- and post-interaction practices and structures. To help organize and make sense of my inductive findings, I first describe the challenges of learning in these air medical transport teams and how Sigma Flight and Gamma Flight address this challenge with differing degrees of vicarious learning, before laying out the multi-stage process model of how individuals organize for vicarious learning that emerged from my analysis. Specifically, I use the differences vicarious learning between Sigma Flight and Gamma flight to elucidate the nature of the interactions that enact this vicarious learning, as well as how formal structures and informal practices coalesce to help prepare and enable individuals to engage in these interactions, while also contributing to the elaboration and reinforcement of the learning stemming from these interactions among air medical transport team members.

The environment air medical team members face is one of intense ambiguity coupled with an unusually high degree of responsibility, requiring them to engage in ongoing learning and development to stay on top of the demands of their work. Whereas a nurse in a hospital is typically responsible for one particular type of patient, and relies on a team of physicians and

other nurses to make treatment decisions and assist with care (respectively), in the air medical context, team members have only themselves and one another to rely on, and are often forced to make decisions that would not be within the purview of a nurse in the hospital context. As the flight nurse below notes, this combination of complex patients and limited resources can serve as a challenging work environment, encouraging team members to engage in continuous learning:

There are cases that are very, I don't want to say overwhelming, but very complex. I sometimes will walk to the bedside and take a minute to just do that quick "once-over" look. There are times when I still think, "Where the hell do I start?" When they've got nine drips [IV lines] going, [they're] on a ventilator, and [with] chest tubes and suction, and the blood components are infusing and they're increasing the drips or decreasing drips, or adding more drips – sometimes it's amazing what we come across. It's interesting that there'll be four or five people in a room working on this one patient. Then when we get here, it's got to be the two of us. ... Not every single case is like "to the max" with complexity I guess, but even the simplest case can demand a lot from you. I think I've seen a lot, I've done a lot but I'm sure there's more. I feel like if I don't learn something new every day then it's time for me to go home.

The learning challenge for these flight team members stems more from the degree of ambiguity in the cases – the need to decide how to treat a patient in the face of equivocal information – than from uncertainty (lacking information about what to do; Weick, 1995), although both challenges coexist in their work. Flight team members possess a great deal of technical knowledge, but their work requires them to engage in sensemaking (Weick et al., 2005), deciphering often conflicting cues or signals to determine how best to treat and transport a patient. For instance, during my observations at Sigma Flight, I observed the transport of a patient who had been diagnosed at a small community hospital with signs of a heart attack (a myocardial infarction [MI]). En route back to the university hospital, the patient became extremely anxious and began pulling off his oxygen mask. The patient had informed the crew that he got nervous flying and might become airsick, but anxiety is also a sign of a worsening heart attack, so the patient's agitated grasping at his mask could have multiple causes (equivocality) that would require very different treatments. Over the flight intercom (activated through a microphone in each team member's helmet, which the patient is unable to hear), one of the flight nurses commented, "This guy makes me fucking

nervous... If he infarcs [has a heart attack] there isn't that much slack to pick up... damn it, why is he taking off his mask again? I hate MI patients, especially anxious ones..." to which his partner replied, "Exactly. Is he anxious from flying or from his heart crapping out? We don't know, so we can't give him meds to mellow him out, which would reduce his anxiety, but would throw his heart out of whack and probably cause him to have an MI. It's a fine line." This responsibility for making treatment decisions in the face of ambiguous patient symptoms is one of the key challenges for flight team members, and represents a significant departure from the experience these nurses would have in their prior work (i.e., within the hospital context).

Though both Sigma Flight and Gamma Flight team members face this ambiguity and responsibility for patient care, my findings revealed stark differences in the learning strategies used to meet these challenges. Team members at Gamma Flight utilize a primarily individual-focused system of learning and continuing education, engaging in independent study and review of clinical materials, or attending courses to maintain their certifications and knowledge. As two Gamma Flight team members noted, when asked how they engaged in learning,

I use journals as much as I can. I'll try and read journals and also ... [the university] has a website called *UpToDate* [that] ... we can access from work. You can pick any topic, any diagnosis or condition and it gives you all the current research - that is actually really great. ... [In terms of learning] probably the benchmark for me is [two other flight nurses]... they basically read journals continuously and then, [one flight nurse] especially, will go to a lot of in-house programs and continuing ed[ucation] that he can get. I try to do at least one conference a year, just to get fresh information ... we get the emergency nursing journals, so you have research articles in there too ... I think for the most part we're all highly driven people, and that leads to a lot of seeking our own information.

By comparison, the focus of learning at Sigma Flight tends to be more interpersonal, utilizing formal and informal interactions between flight team members (i.e., at weekly rounds or just in informal discussion during work) as a key site of vicarious learning and ongoing development. In sharp contrast to the emphasis on journals and courses, the Sigma Flight team member below

(along with the examples in Table 1) describes her learning processes as much more social, relying on interactions with peers as a fundamental learning mechanism:

We do, I don't know, 1000, 1200 flights a year, and we don't work all the flights, right? I don't know everything that is happening with everybody's flight, so those interesting cases that I don't know about that I get to hear about at rounds are cool, because guess what? Tonight I may have to deal with a case or something very similar. ... I listen to them present the case and then as they are going through the case and what things they initiated and things they provided, I start dissecting it, "Okay, so you guys start this drug, tell me why." I learn best by trying to pick their brains on their rationale for things. I'm not a learner with a book. Give me an example, show me. I think that is what rounds are. They are great examples of things, of real-life situations that I may encounter at any time in my career. I don't want to read about Toxic Shock Syndrome in a book. Tell me about your case you have just flown. What did he present? What did it look like? What did you do for him? We have protocols and stuff but what if you guys added something that wasn't in the protocol? Tell me why? Did it work? That kind of stuff, I learn that way from somebody's example versus just reading what it is in a textbook and what they may look like.

These social learning interactions allow team members at Sigma Flight to complement their own learning efforts with the lessons of others' experiences, providing an additional source of knowledge and development. Indeed, as one Sigma Flight nurse aptly summarized, "It's 1,400 experiences a year that I don't have [personally]. The more you know about those other patients, the more you're ready for the next one."

Importantly, these differences in learning strategy are not dichotomous, and interpersonal learning certainly does occur at Gamma Flight (as does independent learning at Sigma Flight). However, my observations and interviews clearly revealed that the general emphasis is on an independent strategy at Gamma Flight, with interpersonal learning viewed as less of a core mechanism for development. One Gamma Flight team member noted:

We have just such a huge variety of con-ed [continuing education] classes that we can take, and different conferences that we're able to attend and be a part of – so making sure that you are constantly taking classes or in conferences when you can afford to be off of staffing is a big deal. [Also] we have some of the best nurses and respiratory therapists that are out there. Most of them are really, really good resources to go to and just have discussion with. Our medical director [also] does a lot of our case reviews and presentations at our monthly staff meeting. We have open discussion about that and he gives us his input and that kind of thing. I think

that helps too to actually discuss actual cases and treatment plans that a crewmember did. ... [However] there's supposed to be a staff meeting and [then] our education, but it's pretty much more of a staff meeting. We don't really get a lot of education in those, per se. We'll usually review two or three cases [and] that's pretty much our education. That's probably one of the things our program could do a lot better on, ... we've just kind of I think dropped the ball on that.

As this individual describes, though there are opportunities to learn through interactions with others at Gamma Flight, these are seen as relatively minor in comparison to more independent forms of learning (e.g., enrolling in outside classes and conferences, see Table 1).

Reinforcing this independent approach, during my shift observations at Gamma Flight, there were many times that team members spent several hours in separate rooms, working independently without interacting with one another. Whereas the flight nurses at Sigma Flight spend their entire shift in a shared office area, because the shifts at Gamma Flight are longer (24 hours), each team member is provided a private room to rest. As emphasized by one Sigma Flight nurse who had spent a number of years working in another program, this opportunity for isolation encourages a more independent learning approach, limiting individuals' learning from one another. This team member goes on to suggest that this limited learning also restricts individuals' ability to care for patients, resulting in outside agencies (such as local EMS or small community hospitals) preferring to request Sigma Flight for more complex cases:

At the other program that I worked with, basically their learning is self-study or self-‘whatever you want to do’. The goal would be to sometimes bounce things off of each other, but as I found, ... many of them would go to a room and go to sleep. That is why they [outside agencies requesting a transport] call us [Sigma Flight] and we [transport] certain things and they [transport] their certain thing.

This vicarious learning from others' experiences at work, as a supplement to learning from one's own experiences, thus came to the fore in both my observations and interviews as a valuable learning mechanism, allowing air medical providers to extend their own patient care capabilities through the lessons of others' experiences. For instance, one example of this learning from others' experiences impacting a future patient occurred during my observation of a Sigma Flight meeting, where several flight nurses were discussing a recent case. The case involved

transporting a patient who had flipped his bicycle and impaled the handlebars into his torso, and one of the flight nurses who transported the patient noted his unfamiliarity with impalement injuries, saying, “I had never actually seen something like that before.” When I asked the two transporting nurses how they knew how to treat and transport the patient, despite admitting that neither of them had ever dealt with such an injury, one replied, “Well, I haven’t done it, but it’s been done before. A while back, we transported a pregnant lady that fell off a balcony and landed on a microphone stand. [To the assembled group] Do you guys remember that one? It was such a crazy story, because the angle it went in, it missed her heart and the baby, and both she and baby did well.” When I commented that this recent experience must have been memorable, one of the flight nurses replied, “No, that was actually, gosh, probably almost ten years ago. It was before I got here. But you hear that story, and you show up on a scene and it just kind of kicks in – well, that’s what they did with her [the microphone stand patient], so that’s as good a place as any to start.”

I draw on these differences in the degree of vicarious learning at Sigma Flight and Gamma Flight to develop a detailed process-model of how individuals organize for vicarious learning. My goal is not to causally explain the variance in practices across the two sites (i.e., to explain the causes and consequences of Sigma Flight displaying more vicarious learning than Gamma Flight), but rather to harness the variation between the two sites to develop a richer understanding of the process of vicarious learning itself. For instance, drawing comparisons between the two sites revealed that vicarious learning is enacted through interpersonal storytelling interactions that occur in designated contexts and are triggered by key contextual cues. Moreover, these comparisons further revealed that although Gamma Flight also engaged in these storytelling interactions (to a lesser degree), the interactions at Sigma Flight were further facilitated and reinforced by particular formal structures and informal practices. This variation thus revealed a more nuanced, complex model of the vicarious learning process, involving not only how vicarious learning is *enacted* in the moment of an interaction, but also how it is *enabled* before an interaction (i.e., how structures and practices build individuals’ capacity for,

and attention to, a vicarious learning interaction) and *elaborated* following an interaction (i.e., how structures and practices reinforced and crystallized the learning from an interaction).

In the sections below, I use these labels of enabling, enacting, and elaborating (cf. Vogus, Sutcliffe, & Weick, 2010) to articulate in greater detail the three-stage process model of vicarious learning that emerged from my analysis. Consistent with the two research needs identified at the outset of this paper, I begin by focusing on how vicarious learning is enacted through storytelling interactions (to uncover the interpersonal micro-processes of vicarious learning), before turning to how these interactions are enabled and subsequently elaborated in the organizational context (to explore how formal structures and informal practices coalesce with interpersonal processes to impact vicarious learning).

*****Insert Table 1 About Here*****

Enacting Vicarious Learning

Analyzing the observation and interview data gathered at Sigma Flight revealed that vicarious learning was enacted primarily through informal interactions between flight nurses, where stories of prior experiences are discussed, analyzed and interpreted. Stories, and the process of storytelling (as a performance where multiple individuals interpret past experience; Boje, 1991), have been recognized as sensemaking and sensegiving processes in organizations, providing a useful basis for developing shared meanings and understandings of an experience (Garud et al., 2011; Sonenshein, 2010). As Weick (1987, p. 125) notes, stories also “register, summarize, and allow reconstruction of scenarios that are too complex for logical linear summaries to preserve” (see also Browning, 1992). These characteristics make stories a useful tool for vicarious learning among flight team members, as it allows them a means of sharing the complex, ambiguous experiences they have in their transports. As one flight nurse articulated:

I think we tell stories. ... I think every report-off [discussion at shift change] is a very animated storytelling process I think. ... You start out with, "Did you guys do anything last night?" [and they reply] "Oh, yeah, we did this and it was a hot mess, and this is what we did and [that] is what we did." ... That's the first process ensuring the information is shared. ... I learn from that.

This response highlights the informal nature of this storytelling, providing a means by which flight team members can recount both the successful and unsuccessful actions of a transport and provide the necessary context and background information in which to those actions were situated. The narrative format of these interactions allows individuals to convey the rich, nuanced, and tacit details of their experience, which are often the most important pieces for informing others' future treatment of similar patients. For instance, as the quote below demonstrates, these stories not only convey clinical facts, but also provide a forum for discussing more tacit elements of the job (such as communicating with staff at a referring facility):

[Interactions consist of] "Hey, these are the snags I had. We slammed a seatbelt in the door." It's often logistical things in the shift change hand-off, but the medical stuff does come up, too. "Hey, did you know we're doing this here? Hey, did you know this?" I mean back to the other patient ... with the dissection [a case where an outside hospital had administered heparin, a contra-indicated drug for an aortic dissection], I learned about that guy because they were talking about the 20-hour surgery and the fact he died ... [You learn several things:] If somebody pushes heparin on a dissection, which will happen again, what do you do? How do you give dantrolene [a drug given to reverse the effects of the heparin]? Because I've never given it, I've seen a bottle of it once. What can you do when somebody's [at the referring hospital] is pissed off at you? How could you have headed that off from the beginning? You can't nice guy your way out of every situation. How do you diffuse that? Those are three interesting things right there

In this way, storytelling interactions provide a forum for discourse, where both the storyteller and listener(s) contribute thoughts and experiences and have the opportunity to learn and change their future practice. Indeed, at Sigma Flight, it is the interest and engagement of the listeners that transform a report-off at shift change into a vicarious learning interaction, rather than simply a quick statement of facts from the prior shift:

I also think it's two-way [communication]. I think if you're not interested in what I'm saying, then [the report off is] pretty short, but a lot of times they are curious, [they'll ask] "What did you do? How'd that work out? Did you have to tube [intubate] him?" All that stuff, [including] "Did the tube go well? What's the SICU [Surgical Intensive Care Unit] like today? Did they have their act together? Did they not?" ... It gets you ready. [You think] "Okay, these are the things I need to be ahead of today because they were caught last night." ... It may happen or it may not happen, but at least it's in your thought process.

To better illustrate this discursive, interactive storytelling process, and how it informs flight team members learning, I present below an example, from my field notes, of a report-off interaction that I observed and captured as close to verbatim as possible. This interaction took place a few feet from the entrance to the flight nurse's work area (just off the hospital helipad), and unfolded within a few minutes of the incoming flight nurse's arrival:

18:45: As Justin arrived for the beginning of the night shift, he told Matt, "Oh, we had a good one, me and Jake the other night. It was a crazy tension pneumo [pneumothorax, a collapsed lung]." Matt replied, "Oh yeah, how'd it go?"

"It was so crazy. We get in the back of this ambulance and there's just too much to do, so we split up. I take the airway and Jake starts getting chest-tubes in [the patient]. I tried twice to get the airway, but when I would look in there, everything was shifted - the epiglottis was super deviated. So I checked, and sure enough he's got some crepitus in his chest, so I'm thinking, 'Man, this guy's got a pneumo!' So I tried twice, took two looks at it, but it was so deviated, we ended up just using a S.A.L.T. airway [a supraglottic airway laryngopharyngeal tube, an emergency airway device used when standard intubation is unsuccessful]. But it was a real cluster - when we got back, I guess anesthesia didn't know what a S.A.L.T. was, so they ended up removing it by accident when they transferred him, and he had a bad event while they were trying to get him transferred. They recovered though - they ended up cric-ing him [performing a cricothyrotomy, an uncommon surgical airway procedure]. So I guess, the question I had was, could we have handled it better? Tell me what you think. James and I debriefed afterwards and he asked me if I would have done anything differently."

Matt replied, "No, I don't know what I would have done - if the epiglottis is that deviated, there's not much you can do to try to get him tubed. You know, it reminds me of some of my first days as a tech in the ER. This guy came in, and I had palpated his chest and I was like 'that's weird, its kind of crunchy...' and then the resident was trying to tube him, and I just heard him saying 'That's so weird, it's like everything is shifted over. What the hell, how do I get this in there?' And I was just standing there, and then it suddenly hit me from the book - like I had read it but it just didn't click - crunchy crepitus and a deviated airway, this guy has a tension pneumothorax! So I go to run over and tell the resident, but they've figured it out and are handling it. But it's funny, I always think about that - I was just sitting there, bumming around and all the sudden it was like 'Oh shit, I know what's wrong with him!' But I've never run into it that clearly again in the field, so I don't know that I would have done anything different."

Justin followed up by asking, "I mean, would you have worked together with your partner, done things one at a time rather than splitting up tasks, so that we could both be focused on the airway?"

Matt replied, "I mean, that might have helped, but the only thing that was going to un-deviate his airway is getting a chest tube in, so you kind of have to be doing both...I think I would have done exactly what you guys did, hauled ass and got him back. I think it was a solid case."

This exchange highlights the interactive nature of these vicarious learning interactions, as they are not simply narration of one person's actions and experience (that can then be imitated by others), but rather involve the exchange of ideas and experiences by multiple parties. Indeed, it was quite common for one story to be met (as in this example) with another story of past experience, and this discussion and comparison of experience allowed all individuals involved in the interaction to enhance their understanding (as compared to perspectives on knowledge sharing in organizations that emphasize the one-way transmission of knowledge from more experienced to less experienced individuals; Matzler & Mueller, 2011). Rather, even highly experienced individuals can learn from these interactions, by testing their existing understanding against others' experience, and updating their knowledge by recounting and re-interpreting their prior experiences for others (e.g., Weick & Roberts, 1993).

Triggering stories in downtime. This example of a vicarious learning interaction also highlights an important contextual determinant of this learning process – the provision of a mutually agreed-upon time and space for engaging in vicarious learning (e.g., Connell, Klejn, & Meyer, 2004). Interestingly (and in contrast to prior studies; e.g., Orr, 1996), flight team members do not engage in these storytelling interactions during their actual task performance (i.e., during the flight itself), but rather in designated "downtime" between flights. Because of the time pressure facing flight nurses when treating a patient, it is necessary for them to learn and gather knowledge from others during their downtime, so that they can be ready to implement this knowledge when they are on a flight in the future. As one flight nurse noted:

[During transport] is not really the time for sharing war stories I think. I think there's too much going on for there to be a "hey, listen to this story" or "this happened and this...". It seems to be a more informal, [when you're] sitting around sharing war stories.

In this sense, Sigma Flight team members have created and maintain a shared expectation for when it is appropriate to engage in vicarious learning interactions and storytelling (a “story time”). This shared expectation transforms what would typically be viewed as “lost” time (time spent waiting for the next task assignment) into a designated space for engaging in informal learning from one another. Underscoring the importance of defining this space for learning, interviews with Sigma Flight nurses revealed that many felt they learned just as much in these informal, downtime interactions with their colleagues, as they did from gathering direct experience through transporting patients. One Sigma Flight nurse summarized this notion well, describing how team members learn from each other even on days when an entire shift passes without receiving a request for a transport (vs. a busy day with four requests):

Everyone learns from each other, [by] flying together, running scenarios, bullshitting with each other, [or] sitting around here. We'll bring stuff up and somebody will say, "Well this is how we did it here," "This is what they do now," or "I remember a time when..." You may not fly, but I tell you what ...you may learn more on that 12-hour shift with your fellow co-workers, [than] had you gone on four flights.”

Though the entire downtime of a shift (including meals, equipment cleaning, etc.) provides opportunities for these vicarious learning interactions, one designated “story-time” that Sigma Flight nurses rely on extensively for these learning interactions occurs at shift change, where the outgoing crew hands off the ship to the oncoming crew for the next 12-hour shift. Shift hand-offs have long been recognized as sites of knowledge exchange in hospital settings (Cohen, Hilligoss, & Amaral, 2012), but these exchanges typically focus on transferring information about a particular patient to the oncoming staff that will be caring for that patient. At Sigma Flight the oncoming team members are unlikely to ever interact with a patient transported during a previous shift, but this space is still utilized for sharing experiences of transporting prior patients, in the event that the other team members might encounter a similar patient at some point in the future. This shared practice of telling stories at shift-change is practiced diligently throughout the team, even when circumstances change normal shift times. For instance, while observing a night

shift (which typically run from 7PM to 7AM), there was a scheduling conflict that resulted in two nurses changing shift at 3 o'clock in the morning. Despite the oddness of the hour, they nonetheless conducted their handoff and engaged in a lengthy discussion about a prior transport immediately after the oncoming nurses arrival, as an excerpt from my field notes demonstrates:

02:50: Donald arrived. As he entered, Eli took off his headphones and told him, "We didn't do much tonight, just had the balloon pump [transport] earlier." Donald responded, "Did Andrew tell you about our guy who turned purple [indicative of serious difficulty breathing]?"

Eli asked, "Did he have a pneumo?" Donald replied, "No, he was just having trouble, he all the sudden was complaining of pain breathing."

Eli asked, "How far out were you guys?" Donald responded, "About 5 minutes out... pilot asked if we wanted to hot offload [unloading the patient without stopping the helicopter rotors, in order to save time], I looked at Andrew and we said 'yeah, lets do it.' We hot offloaded him, and as soon as we got to trauma, some intern is trying to intubate him with a big old blade, and the dude is wide awake, no drugs, no nothing. We ended up sedating him and taking him straight to OR [Operating Room]."

By engaging in these storytelling interactions in the downtime between their actual transports, vicarious learning at Sigma Flight is largely prospective (learning things from others' experiences that might be needed for some future transport), rather than problemistic (searching for a solution from others' experiences to a current problem), as has often been assumed in prior literature (e.g., Orr's [1996] examination of Xerox repairmen, who would share stories of prior repairs while sitting in front of the disassembled, malfunctioning machine). This prospective nature of the learning interactions thus calls attention to a need to understand what "triggers" these interactions. While problemistic learning is triggered by the need to resolve the current problem at hand, Sigma Flight nurses must rely on other mechanisms to trigger vicarious learning during their downtime. Learning interactions can be triggered by both the potential sharer of an experience, or by someone who might desire to learn about another's prior experience (see, for instance, Bailey and Barley's [2011] study of learning triggered by both learners and teachers), as individuals draw on objects or actions within the environment that cue

them to engage in learning (Weick & Ashford, 2001). For instance, though the designated “story time” at Sigma Flight (i.e., downtime between flights) provides the arena for vicarious learning interactions, the content of the interaction is often triggered by one person’s review of another’s chart – the documentation of a mission. These charts provide an overview of the actions and events of a transport (i.e., medications administered, patient vital signs at regular intervals, etc.), and can trigger vicarious learning by making an individual aware of another’s experience and cueing them to ask about it. The learning benefit of others’ transport experiences lies primarily in *why* they engaged in particular actions (i.e., their decision-making processes), rather than *what* they actually did, and though charts provide excellent documentation of what occurred, they do less to describe the underlying reasoning or decision-making process. Thus, as the flight nurse below describes, the chart does not capture the complete “story” of the transport, but rather serves as a starting point for learning from the other person’s experience:

Another one of the things we do is all the charts are reviewed. ... I think that’s an important learning thing. ... I could have reviewed your chart today and then work with you tomorrow and at breakfast it’s like, “You couldn’t transport that person? What happened?” I don’t want to say that is the ‘real’ story, but [it reveals] more about what you think happened ... For instance, you don’t document that you went some place and had a bad [interpersonal] experience like last night, when [they] had a bad experience [with the staff at an outside hospital].

Vicarious learning interactions can also be triggered by more informal aspects of the context, including a story that someone else told, or even something mentioned in passing in the background, such as a television report (as described in Table 2). For instance, in the shift change communication detailed earlier, Justin’s experience with a difficult pneumothorax patient prompted Matt to recall his own experience treating a similar patient. In this way, triggers serve a critical (but under-appreciated) function in the vicarious learning process, helping individuals draw from a broad pool of latent experiences to select one to share that would be relevant for the learning interaction. This became clear in interviews with flight team members when they were asked to provide an example of a time when they had learned from another’s experience. Many team members had difficulty recalling an example “on demand” during the interview, despite

being able to tell stories of prior transports in great depth during vicarious learning interactions while working shifts. As the flight nurse below articulated:

They're [stories] usually specific to whatever the discussion is. If it's an ARDS [Acute Respiratory Distress Syndrome] case everybody's got their stories on what they do in an ARDS case. ... I don't know if I have a representative or iconic story ... I'm not very good at pitching one out of the air.

Focusing on peer experiences. The emphasis, noted earlier, on telling stories to help understand *why* team members engaged in certain actions (rather than just simply documenting what they did, as in a chart) points to an additional element of these vicarious learning interactions. This vicarious learning is focused on understanding experience (i.e., the entire process of a prior transport), whereas other learning activities tend to be focused on gathering information (i.e., evidence-based guidelines for treatment of a particular condition). Weick (1995) captures these different goals of learning by distinguishing between actions directed towards resolving equivocality from those directed towards resolving uncertainty. Uncertainty stems from a lack of information, and requires individuals to look for additional facts and ways to interpret them, whereas equivocality refers to a state of confusion (rather than ignorance), where individuals face multiple, often conflicting, meanings or interpretations of an event. Though individuals can resolve uncertainty by seeking out additional information, Weick notes that resolving equivocality requires more in-depth interaction that creates a frame of reference for processing the ambiguous information in the environment. He describes this interaction (citing a passage from Huber and Daft) as occurring when individuals “organize cues and messages to create meaning through their discussion and joint interpretation” (Huber & Daft, 1987, p. 151; as cited in Weick, 1995, p. 99).

Given that the learning challenges facing flight team members often involve ambiguity and equivocality (as described in the earlier example of a heart attack patient whose anxiety could have been caused by multiple issues that would require exact opposite treatments), the experience-focused, discursive vicarious learning interactions these individuals engage in

provide a useful forum for the kind of joint interpretation Weick describes. Indeed, among the Sigma Flight team members, these interpersonal vicarious learning interactions formed a distinct, differentiable learning activity that complemented their more independent, uncertainty-resolving learning activities, such as attending courses or asking the advice of an expert. For example, as the flight nurse below highlights, they often learn from physicians or other experts within the university hospital, as these individuals can provide new information about a medical topic:

I think that's another thing that's associated with working here because first of all the people that you work with are bright and educated and love to share knowledge, [but also] the people that you bring patients to are bright and educated and love to share their knowledge with other people. ... If I have a question about something, the answer is right upstairs [in a unit of the university hospital]. ... We have to work with all the new residents [in these units], who are sharp. They're sharp, they bring us information.

This reliance on superiors and experts as a source of concrete knowledge is consistent with existing perspectives on information seeking (which generally casts individuals as more frequently seeking information from superiors, rather than peers; Cross & Sproull, 2004). Yet, when flight nurses describe their practice of vicarious learning, where they are attempting to understand the more tacit, procedural elements of transporting patients (dealing with the ambiguity of transport, rather than a lacking piece of clinical information), they emphasize their peers as the primary individuals with whom they would engage in storytelling interactions. In order to learn how to manage the ambiguity of their work, these flight team members rely on the discourse-based processing of prior experiences that only others who have “been there” and dealt with the full range of a transport experience (i.e., the clinical, social, and emotional elements of flying a patient) can provide:

One of the things it's really helpful is hearing the experiences of my colleagues. ... We talk about these really critical patients and the complex transports that they do and the procedures that they do. ... It helps me to kind of pull all that information together. ... It's like knowing that we're all doing the same job and that they've done it. They've experienced it. This is what they have learned. This is the way they did it and it worked well for them. Or when we've had those cases where [you realize] “Oh yeah, next time I won't do that. I'll do it this way.” That also is very, very helpful in knowing what works and what doesn't work.

These interpersonal storytelling interactions between flight team members, characterized by peer-to-peer discourse about prior experiences triggered during designated downtime, thus constitute the mechanism by which individuals enact in vicarious learning. However, though these interactions are necessary for vicarious learning, comparing Sigma Flight and Gamma Flight learning efforts revealed that storytelling interactions alone are not sufficient to organize for vicarious learning. Indeed, flight team members at Gamma Flight engage in similar, though less frequent, storytelling interactions that also occur between peers during downtimes like shift change, as the Gamma Flight paramedic below notes (and as also evident in Table 2):

We do shift change, [and] we spend the first hour sitting, talking ... basically, telling the things we need to know about the helicopter or equipment or staffing issues or those types of things. ... There have been numerous times where I've heard the [outgoing] crew ran into something or had a situation or issue ... Sometimes, it turns into a training session at shift change where we would pull out the protocol book and we look at it and you may have four people in the room and all of us had a different thought on what [the answer] was supposed to be.

However as noted earlier, these interactions at Gamma Flight were not as substantial a source of learning as those at Sigma Flight, suggesting that there may be additional, necessary elements in place at Sigma Flight that facilitate vicarious learning. Further analysis of the observation and interview data at each site revealed a combination of formal structures (e.g., organizational policies and required procedures) and informal practices (e.g., shared learning norms or unofficial activities) in place at Sigma Flight that served to *enable* more effective engagement in vicarious learning interactions, as well as *elaborate* the learning emerging from the interaction.

*****Insert Table 2 About Here*****

Enabling Vicarious Learning

Enabling elements refer to the structures and practices that prepare Sigma Flight team members to better learn from one another's experiences in their storytelling interactions. Specifically, various formal structures within the organization, as well as team members' more

informal norms and practices, help ready individuals to more frequently and effectively engage in these vicarious learning interactions.²

Fulfilling learning requirements. One set of formal structures that enable individuals' vicarious learning at Sigma Flight are the mandatory learning requirements and scenario-based training sessions that all flight nurses must complete (typically each quarter). The goal of these required learning "modules" is to compensate for areas where flight team members may not get adequate exposure through their day-to-day work. For each major diagnosis or treatment category, such as obstetric (OB) or neonatal care, the flight team members will be required to log a certain number of hours of learning credit, as the flight nurse below describes:

Yes, we have a different module quarterly, and we just finished our OB and neonate. Because we do very few OB and neonate transports, we have to go get that education. [The education coordinator] will set up a lecture and we will get two hours worth of a lecture on OB but ... we have to have four hours [total], and we don't get four hours unless we go to the OB unit for two hours.

Though on face, these required training hours seem to reflect more of an independent approach to learning, and indeed these required training sessions and "con-ed" classes form a core component of the independent learning at Gamma Flight, they play a different role at Sigma Flight. As the educational coordinator described to the staff during a weekly meeting:

Look, let's be honest: four hours is not anywhere near enough for mastering the high-risk OB cases that we fly. You're not going to learn everything you need in those four hours, and no one expects you to. What those four hours are for is to make sure that you are familiar enough that when somebody does fly one of these cases, and we sit down and debrief it, or discuss it during rounds, that you are able to get something out of that. ... It's to make you familiar enough to have a good discussion about the few cases of high-risk OB that we do get, so that we can all learn from those.

² I define "effective" engagement in these interactions as that where individuals recognize the learning benefit of the interaction, and develop their knowledge and capacity to respond to a future event as a result.

In this sense, rather than having required education courses form the core of learning (as is the case at Gamma Flight), Sigma Flight team members use formal learning opportunities as tools to build the baseline understanding necessary to effectively engage in vicarious learning. Establishing this shared baseline understanding allows individuals to draw more out of others' stories, as the flight nurse below describes when asked how Sigma Flight prepares new flight nurses for the variety of tasks they will face:

When we talk about stuff at rounds, [new staff] are familiar with it, but not familiar with the specific circumstances. They know an unconscious 22-year-old in a car is not good, [but] they've never experienced that. Now, they've seen an unconscious 22-year-old in the ICU, and they know that the patient is going to need to be intubated ... [B]ut again I could tell you all day long how to put the tube in [perform an intubation], but you've got to come to the [training] lab and see it, and do one. When you've seen one and done one, you're like, "Oh. Oh, okay. Okay, got it." It will be like me, telling you about a Walt Disney movie, if you've never seen a movie, I'm sorry ... unless you've seen a movie, you're not going to be able to conceptualize that.

This two-step learning method, where individuals obtain the basic understanding through formal training and education and then expand on that understanding through vicarious learning, allows team members to make the best use of their mandatory education, and creates a shared logic for learning (i.e., independently establish baseline, then seek others' experiences). For example, as one of the newer flight team members described when asked about his process for learning:

If I don't understand it, I will look it up first, just to get a basic understanding, and then I'll ask the flight nurses to kind of give me a context, or a little additional information about it, or how it would apply to us. ... A lot of them will give me stories of their experiences, what they have seen, what's worked for them, what hasn't worked for them. That's kind of the good standard approach to it.

Hiring generalists. A second formal structure that enables vicarious learning within Sigma Flight lies in its staffing policies. Sigma Flight transports patients with a crew of two flight nurses, who are also dual-licensed as paramedics, and team members fly patients of any age when flight requests come in (from neonatal patients to adults), requiring that individuals have multiple years of experience in adult and pediatric nursing units (across both emergency

departments and ICUs). By contrast, at Gamma Flight crews are more differentiated, with dedicated, separate teams for adult and pediatric transports, and teams fly with one team member certified as a nurse, and another certified as a paramedic (or a respiratory therapist, on the pediatric team). As a result, team members at Sigma Flight are better able to develop shared practices and understanding, as the flight nurse below notes when comparing Sigma Flight nurse/nurse teams to more differentiated nurse/paramedic teams at another program:

Another program [I flew with previously], you're flying a nurse and a paramedic and so the level of education and priority is totally different ... I don't know everything 100%. I can't know everything 100% and so I depend on my colleague to bounce things off of, or if I'm in the aircraft, to assist me and also understanding what's wrong or what the parameters are. For example, flying for them, the paramedic and what his normal values are looking at that monitor, totally different than what my normal levels are, but that's because his background is so much different than mine and so is the training, where here ... I can fly with any given person and we know the steps that what we're going to do. We know the process ... and that's what also allows us to continue to go ahead and grow.

Sharing this similar educational background and expectations for learning enables the flight nurses to “speak the same language,” both during their transports and in recounting them afterwards, facilitating their ability to share experiences with one another. Across the entire team, there is a common core of knowledge, language and identity that facilitates their ability to develop shared meanings about an experience that someone may share. By comparison, these shared meanings are more difficult to develop across Gamma Flight, as the divisions in certification (nurse, paramedic, respiratory therapist) and specialty (pediatric, adult teams) create divisions in identity and knowledge. For example, when Gamma Flight team members gather for their monthly education and staff meetings, education is conducted separately for the pediatric and adult teams, as the team member below describes:

...[At these meetings], we separate people [by specialty] for education because they do so much different work. We're free to attend either one, but they're both offered at the same time, so we really know that they split them up. The peds [pediatric] education is much more organized and formal than the adult education ...[because of] who sets it up.

(Interviewer) Is there a lot of cross-education between peds and adult teams?

It's pretty exclusive to one or the other.

These staffing policies also enable vicarious learning at Sigma Flight by creating greater potential for the spread of stories between individuals. By maintaining a pool of “generalist” flight nurses, it is conceivable for everyone to work with one another. Though Sigma Flight has team members who work the day and night shift, there are also team members who work “rotator” shifts, and day or night shift team members also occasionally work a different shift time when filling in for someone else. This scheduling allows experiences to be shared more broadly, as team members can interact with almost all of their peers and learn from their experiences:

I think that’s another interesting thing because we don’t have regular partners. Today I’m working with Kristina. Tomorrow I might be working with somebody else. All the stuff generally gets shared. By not having permanent partners my perspective gets shared with you and your perspective gets shared with me. ... We’re like individual teams but we’re also really one big team.

At Gamma Flight, the specialized certification of each person creates three sub-pools of team members, making it extremely unlikely that two members of the same pool would work together (i.e., two nurses may never work together, as they would always be paired with a paramedic), and thus restricting the potential set of partners for individuals’ vicarious learning interactions. At the same time, this specialized staffing also creates a sense of domain expertise for each of the three sub-pools, restricting the range of peers with whom an individual might discuss a case. For instance, after a difficult respiratory case, Gamma Flight team members might typically seek out a respiratory therapist to discuss the case, missing insight that a nurse or paramedic might have had about the flight and limiting their opportunity to engage in this broader vicarious learning:

The adult team, we work a nurse / paramedic configuration, and our nurses come to us with at least a combination of ICU and ER background. Those guys are just such a wealth of knowledge. I really lean on my nurses for our ICU patients ... [for understanding] different lab values and things that I may not necessarily be familiar with, [or] different pieces of equipment that I may not necessarily be familiar with. Typically, what happens or occurs is immediately after transferring the patient [diagnosed with a respiratory issue].... I’ll seek out the respiratory therapist after that and talk with them and discuss things with them, so that I know what to do [to] better care for the patient.

Conforming to storytelling norms. In addition to these more formal structures, there are several informal practices that help prepare individuals to more effectively engage in vicarious learning interactions. Indeed, observations and interviews at both Sigma Flight and Gamma Flight revealed that interpersonal storytelling was more likely to occur, and was more effective, when the individuals involved followed informal guidelines and norms for engaging in this vicarious learning. For instance, engaging in storytelling has been characterized as an art or shared performance (e.g., Boje, 1991), and these performance in the air medical teams was accompanied by informal norms and shared rules for how stories should be told. Flight team members spoke openly about the practice of storytelling, and admired individuals who were particularly adept at telling stories, as the flight nurse below notes when describing someone who used to work with Sigma Flight (and who flew the microphone stand injury described earlier):

Jim, who used to work with us, that guy should write a book. He always had the craziest cases, and he would tell us about them. He was a great storyteller - he had a very animated way of describing the scenes and the flights he went on. One time, he flew a pregnant woman who had passed out, fallen off a balcony and impaled herself on a microphone stand, it went right through her lung, missed her heart by this much [holding his fingers up very close together]!

Flight team members at both Sigma and Gamma Flight also described how these storytelling interactions follow a complex set of informal rules. When a story is told, for instance, listeners are often most interested in the thought processes, decisions, or intuitive feelings that the storyteller had, rather than the discreet values of clinical parameters (e.g., blood pressures, heart rate, etc.). As noted earlier, these storytelling interactions help share the more tacit elements of an experience (e.g., how a flight nurse decided to pursue one of multiple, equivocal courses of action), but new flight nurses' prior experience in hospital nursing units would have taught them to only present the objective values and test results (as the physician would be the one making a decision in the hospital context). As a result, the practice of storytelling is something that new flight team members must learn as they join the team:

I mean, presenting - coming in and presenting, and doing it in an open environment in front of your peers is very challenging. And it's very intimidating.

Talking to [a new flight nurse] now, he gets nervous when he's presenting a routine case. You know? I mean, nothing went wrong! It's fine! They just want you to practice presenting. ... They [new flight nurses] have to practice routine cases so that when they do get into challenging cases, they have the format down of what information you need to know.

There are also emergent rules and norms for how individuals respond to the sharing of others' stories and experiences. Though the listener often has similar experiences that provide a basis for interpreting the story, asking questions, and providing feedback to the storyteller about how they could learn from the experience, there is a shared understanding that the listener "wasn't there." In other words, listeners can offer insight and feedback on the experience, but for these vicarious learning interactions to be effective, they must do so in a way that acknowledges the storyteller's experience as unique, and that listeners may not understand all of the intricacies that were involved. As the quotes below (as well as in Table 3) highlight, when individuals approach the storytelling interaction as one where they assume the storyteller did the best they could in the face of a tough situation, the interactions are often more effective for learning. Correspondingly, at both Sigma Flight and Gamma Flight, when these vicarious learning interactions broke down, it was often due to a breach in the informal rules, such as when a listener became overly critical, "armchair quarterbacking" a storyteller's experience:

I think [what helps learning is] a crowd that's willing to know that they can't necessarily throw stones. That they've been there, and that we want to do no harm, but we are not infallible; we are humans. A piece of equipment was forgotten on a transport awhile back, and it was deemed as incomprehensible, unjustifiable, wrong, etc. But the bottom line was, they forgot it. I'm sorry, you can have all the checklists in the world, you can check the check boxes, you can have a Sherpa standing next to you, [but] shit happens.

My patients are kind of my patients to dissect. Somebody else's, you got to be careful you don't step on their toes. You got to be careful you don't armchair quarterback. You don't want to seem like you're armchair quarterbacking, that's a lesson I learned early in the process, because I think people just shut down.

Approaching interactions with a learning orientation. Vicarious learning interactions are also enabled by Sigma Flight team members' shared endorsement of a learning orientation – approaching these interactions with a commitment to learning, and to place this learning above

concerns for how they might “look” to others (Dweck, 1986; VandeWalle, 1997). As evident in some of the quotes above, these vicarious learning interactions often revolved around stories of less-than-successful experiences, and a key enabler of these interactions is the willingness of the individuals involved to discuss their mistakes. A key informal practice among Sigma Flight nurses is thus the shared encouragement to approach these storytelling interactions with a learning orientation. As one Sigma Flight nurse summarized:

We are not perfect and there are going to be things that we can do much better. There are going to be mistakes we have made, but we have to learn from them and the way we learn best is from somebody else’s mistake. If I made a mistake at the bedside with patient care, as hard as that is to go in front of all my peers, [or even] my management and my medical director, and say “I screwed up,” guess what? My mistake may prevent somebody else from doing that. I think it is important to talk about those cases that we could have done something differently or we should have done something differently, or we could have done better, because that is how you learn.

When individuals do not adopt this learning orientation – trying to cover up a potential mistake, for instance – they are not only less likely to engage in vicarious learning (avoiding telling stories of their experiences), but when they do engage in these storytelling interactions, they often devolve into uncomfortable critiques, as the flight nurse below describes:

I try to take ownership in it and come prepared to be able to say, “We screwed up.” Everybody here says that’s the key. ... I’ve seen a couple people say, “Yeah, we screwed up” and it seems to be tolerated really well, but even more than that, is I’ve seen somebody sit there and try to backpedal and justify something that was wrong, and it’s really uncomfortable. [You think] “My God man, save yourself! Just say you screwed up.” ... [Others] can really tell if you start backpedalling, and [when] you’re trying to justify and it just does not makes sense ... [you] better watch out. ... If you go in there and say, “Listen, this is what we were thinking,” ...[and] you take ownership of it, it’s a lot easier than if you don’t. ... Don’t try to bullshit your way [out of it]. ... I just think that fosters professionalism ... I try to take ownership on what I know and what I don’t know, just trying to make life a little bit easier.

Adopting a learning orientation also encourages individuals to engage in these vicarious learning interactions with a broader set of others, including not only superiors or more experienced flight nurses, but also with those who may have less experience as well. Flight

nurses join the Sigma Flight team with a long history of prior experience, and by engaging in vicarious learning with even the newest team members, flight nurses are able to learn from this breadth of experience. Moreover, as the quote below notes, the wide variety, low volume, and random distribution of the patients the flight team transports means that a more junior colleague may actually have greater experience with a particular diagnosis or condition, further reinforcing the enabling effect of adopting a learning orientation on the success of vicarious learning:

If I could do something better I certainly would like input. . . . Over half of the people here have been here longer than me so they've got stuff to teach, and even the people who haven't been here that long [do too]. I've been here 7 years, and I've never done an ECMO transport. Jake's done 6 in the last 2 months.

*****Insert Table 3 About Here*****

Elaborating Vicarious Learning

Complementing the practices and structures that enable individuals for vicarious learning interactions, Sigma Flight also utilizes formal structures and informal practices that serve to elaborate these vicarious learning interactions (see Table 4). These elaborating structures and practices help individuals extend and crystallize the lessons emerging from stories of others' experiences into individual and collective action going forward, allowing Sigma Flight to use vicarious learning as a core learning strategy for improving future patient care efforts.

Reviewing cases formally. One of the primary formal structures Sigma Flight uses to elaborate vicarious learning is its weekly grand rounds sessions, where cases from the prior week are reviewed in a group setting, led by the medical director and educational coordinator. During these meetings, the individuals who transported a particular patient will present their case to the group, and discuss what they learned from the actions and outcomes they experienced. Importantly, these meetings are generally not a "primary" site of vicarious learning interactions, in that prior to presenting the case at rounds, flight nurses will have engaged in more informal storytelling about the case with others, as the flight nurse below describes:

All the good transports - where something was done different or [with] something that's done rarely - those seem to make the rounds around the water cooler, and

everybody hears about them without the need for [grand] rounds or any kind of formal dissemination. I think if there's a good lesson to be learned from a transport, it makes its way through the group in unofficial ways pretty quick. Everybody likes to talk about the transports they have, so you'll hear about it.

In contrast to informal storytelling interactions that address the full range of tacit and explicit elements of an experience (and often pull in details and comparisons to other prior experiences), rounds focuses more on presenting a portion of the case, building consensus with other flight nurses, and getting input from the medical director on appropriate action. Because of the more public nature of rounds (i.e., presenting in front of a large number of peers, as well as the medical director), stories of cases told at rounds tend to be more focused and emphasize only one or two particular issues that the nurses who flew the case (or the educational coordinator) determined would be useful to discuss in a collective forum. Summarizing this focused, condensed nature of cases presented at rounds, one flight nurse noted that, "I think it's cleaner in front of the medical director...it's a cleaner story."

What these grand rounds meetings thus provide is an opportunity to gather as a collective (rather than in dispersed vicarious learning interactions) to address a learning point from a particular case and develop a shared understanding of how to respond. This consensus building, guided by the input from the medical director, is then transformed into changes at the collective level, such as a revision to the program's protocols – documents that provide guidelines (based on evidence and prior experience) for how to handle a variety of patient conditions:

We try to develop and design our protocols to cover enough to keep you safe in pretty much every situation. There are certain basic things that you need to make sure that the patient has in order to sustain normal physiologic responses or as close to normal as possible. ... The process is designed that if that is a case that we present during rounds, then we can take a look at our existing guidelines and say, "Hey, is this something we need additional guidance on? Is this something that we need to revise existing protocols for?" If this is one of those things that you will never see in another million years, then it is probably not worth it but if it is something that hey, after we have discussed in rounds, [other people say], "Hey I have seen it before too and I didn't really know what it was" then you get those "ah-ha" moments where people may actually come together and say, "This is what it really is and this is how we as a group need to respond to that."

Similarly, by providing a regular convening place for the discussion of cases among the whole organization (i.e., not only flight nurses, but also managers, the education coordinator and the medical director), these grand rounds meetings create an opportunity to raise issues that need to be addressed at a higher level. Though the flight nurses can learn from each other through their peer-to-peer storytelling interactions, the lessons of these experiences sometimes require changes to be made at a higher level, and rounds provides an opportunity to raise these issues to managers and directors who can begin to implement the changes. For instance, the flight nurse below describes a case where the team was promised an additional resource from another department - a team of ECMO specialists, who would come to the small hospital where the flight team was treating a patient and bring additional, specialized equipment to accomplish the transport – but after begin told they were coming, the flight team was later told the specialists were unavailable. By discussing the case in rounds, the medical director was made aware of the issue and was able to take up the issue with the director of the appropriate unit within the university hospital:

I think rounds are a very good tool as a review. ... I think that is a great learning tool and that's a great sharing experience to help people who had some of those bad flights to sit and say, "This really sucked. This is what I did. Here I am in that hospital and the ECMO team is not coming." Everybody was like, "Holy crap, what did you do?" That needs to go up farther than just us. Those kinds of things are addressed at a higher level, which is also very helpful in [terms] of doing those flights and coordinating that kind of stuff. ... We need to make sure that if we send our team out that we have support for them. [Since raising it at rounds] it's been better. I think there's been a couple cases where [the ECMO team] did actually go out and cannulate, and brought a couple patients back on ECMO now.

Developing simulations. A second formal structure that the flight team utilizes to elaborate vicarious learning is the use of in-depth training scenarios with patient simulators – advanced, wireless computer-controlled mannequins that can simulate a wide range of illnesses and injuries. These scenarios are used for a variety of organizational training goals, including interviewing and onboarding new staff, as well as for continuing education of flight nurses, and even as a public service tool (where flight nurses will go to a local EMS station, for instance, to administer scenarios). These scenarios are created from prior cases that the team has flown, using

these prior experiences to develop a rich, detailed re-creation of the experience to facilitate others' learning. As one flight nurse involved in the simulation process noted:

Coming up with scenarios is pretty interesting. There's so many things you can do, but it helps having rounds and stuff because you get some great ideas, just [based on] what you've seen out there. It's easy to come up with. We discuss cases, and ... it's like, "You couldn't even make that one up. What happened to that patient under those circumstances, I couldn't make that up. That's incredible." What you do is you take those cases and you make it in to a scenario and you see how other flight nurses would have responded to that same scenario. ... Which is very interesting because some people might have done something different. Others may have done better, done worse, done the same, but that goes back to being able to look at continuity of experience, education and how we all perform.

As this nurse indicated, scenarios reinforce collective abilities, helping to translate the experience that two flight nurses faced into a standard, routine response that all team members could implement. These scenarios are particularly effective for this collective translation, because the simulation process allows for the recreation of the multi-faceted experience that emerged from the story of a case – focusing on not only the clinical challenges, but also the associated experiences (i.e., addressing distraught parents of a sick child or dealing with the staff at an outside hospital) that cannot be captured in a clinical chart or protocol. This realism makes scenarios an effective tool for developing flight nurses' abilities, and helping ensure all team members get practice responding to the conditions that someone faced in a particular case:

When we run human-patient [simulations], we will actually incorporate fellow flight nurses to play a physician, or [get] fellow flight nurses to play a difficult mom and dad [of a child patient]. Our flight nurses have to take care of the human patient simulator, start calling the shots on what are they going to do, what are the things going on, what needs to be done on the patient and actively do it on the simulator. [But] as they're doing that, then you have the physician that we've prompted to come in and be a difficult physician and be like, "Why are you still here? This patient needs a Level 1 trauma center. You need to wrap this patient up and get out of here." ... You get to see [whether] people will put their feelings aside and not get into an altercation with the physician, or you have the overbearing mom that's like, "Save my baby. What's going on? Why are you doing this? Why are you touching my kid?" You've got to take care of the child, [and be able to] deduct the mom. ... Like I said it's all about that realism. You want to bring that stressful situation into the simulation atmosphere, to just come at the person from all angles, because that's what this job is.

By incorporating the “full-range” of tacit and explicit elements of experience into the simulation, flight nurses are able to approximate the cases their colleagues have flown in a repeatable environment, which then allows them to rehearse and develop routines for responding to those situations, reinforcing the lessons learned from the case and spreading them throughout the team.

Building mental repertoires. Beyond these formal elaborating structures, there are also informal, individual practices that serve to elaborate the lessons learned vicariously from others’ experiences at Sigma Flight. Indeed, flight team members consistently noted that they did not learn “automatically” from hearing the story of another’s experience, but had to engage in active efforts to incorporate that experience into their ongoing learning process. As one flight nurse aptly expressed, this effortful learning is the key challenge for team members to continually develop their practice and patient care:

I like the fact that I'm challenged, [that] I could challenge other people, and [that] I can go to the resources and educate myself and hopefully educate other people in [preparation for] that next thing that might come. ... My feeling on this is you're only as good as your next patient. ... Unless you invest in that next patient, you can't use that last 2,000 patients. You've got to use that next one as your reference for how good you're performing.

One way that individual flight nurses learn from others’ cases is by consciously adding a technique or treatment that another person used successfully to their mental repertoire, or removing a technique from the repertoire if another found it to be unsuccessful. While this expanding of the “mental toolkit” occurs subtly during all learning, when flight nurses learned from others’ experiences, they often spoke of making a conscious, deliberate note of the experience in their “arsenal” of treatment. Whereas one’s own experiences more automatically update a repertoire of skills (as the first quote below notes), when considering others’ experiences, flight nurses had to take more deliberate efforts, such as creating tangible artifacts to incorporate the lessons of others’ experiences:

Well, you get flashbacks of prior experiences ... take a scene call [for example]. ... I mean, the big thing is intubating patients at scene calls, and you always think about all the horrible ones that you've been involved in, and you try to improve your technique to incorporate all the disasters that you've had along the way. ... If

you were to do a skill for the first time at a scene call, you might make it, you might not, but you learn from that and you have a little pearl in the back of your head for that procedure. The next time you do it, it goes really well and then you remembered something you did differently, you save that pearl. After about 30 or 40 of those, you've got a little algorithm in the back of your head on how you're going to make it work and how you're not going to let it go bad because of your past experience. You might subconsciously think about those things.

When they [other flight nurses] bring [an experience] up, there are also similar circumstances that I have been in that were so similar, or identical, where I happened to get by it and not have the same consequences ... [so] I can go, "Whew, dodged the bullet there, I'm not going to forget that." ... You learn from it. I mean I write stuff down. Sometimes like, [respondent miming writing on a piece of paper] "Oops, not going to do that."

Orienting future learning efforts. Though flight nurses often directly incorporated the lessons of others' experiences with their own prior cases to update their mental repertoire, a second informal practice used to elaborate these lessons is to allow others' experiences to guide individuals' subsequent independent learning efforts. Given the wide range of knowledge flight team members must maintain, it can be difficult to determine what one should attempt to learn at any given time. In the face of this broad array of potential learning, others' experiences can serve as a useful filtering mechanism, providing guidance on relevant topics on which individuals can focus their independent learning efforts.

For instance, this guidance can involve directing individuals to a new skill to learn, as I observed during a Sigma Flight grand rounds meeting. The group was discussing a case where the flight nurses were required to intubate a patient who was still trapped in the seat of a car, pinned against a tree. Though intubating is normally a procedure done with the patient lying down on his or her back (to facilitate access to the airway), the flight nurses involved had to do intubate from the uncommon position of being directly in front of a seated patient ("tomahawking"), which they had never experienced before. After presenting the case, the medical director and several other flight nurses commented that they had never actually seen it done that way before, and commended the flight nurses involved on using the uncommon strategy successfully. Another flight nurse commented, "Yeah, their case actually inspired us downstairs today – we were sitting there with the [simulator] mannequin for an hour or two, just

to see if we could do it, and to figure out the best angle.” Moreover, beyond introducing new skills that a flight nurse might not have experienced before, stories of others’ transport experiences can also encourage the review of existing knowledge. As the flight nurse below describes, others’ experiences present a vicarious “audit” of one’s familiarity with a given topic, inspiring learning and review of less familiar topics:

It's those conversations that ... provide much more information because it prompts me to [review] what I know, what I don't know, and what I need to go find out. If I'm having a conversation with Bert about the HeartMate II [a new model of LVAD] they transferred; what I hear is, ‘they transferred a HeartMate II, it was a prisoner and they needed to bring him back.’ [Now] I've got to go look at the prisoner transport protocol and find out what are our policies in transporting prisoners. I need to go look at the HeartMate II as opposed to the HeartMate I, and what do you have to bring [with it]. Those were my thoughts this morning - "Do I have to bring a backup battery pack, or do I just bring a controller? When was the last time I looked at a HeartMate II?" [So] I'm going to go back and look at some information on HeartMate II, because it's been three or four months since I did it. I [also] don't know the prisoner transport policy – “Do they have a guard or don't have a guard? Is it okay to take them flying without being handcuffed?" That's what it prompts me to do.

*****Insert Table 4 About Here*****

Discussion

Through an inductive exploration of the ways by which individuals learn from others’ experiences in air medical transport teams, the findings presented here suggest a conceptual model of vicarious learning as an organized phenomenon, involving both formal structures and informal practices that aid in enabling and elaborating the enactment of interpersonal vicarious learning interactions. This grounded process model situates vicarious learning at the interpersonal level of analysis, and demonstrates how vicarious learning interactions can inform both individual- and collective-level learning processes, answering recent calls for rich, qualitative studies of learning and knowledge workers in modern organizations (e.g., Bechky, 2006). Below, I integrate the emergent findings described above with existing theory to develop

a generalizable model of organizing for vicarious learning, before turning my attention to the model's implications for the study and practice of vicarious learning in organizations.

Organizing for Vicarious Learning

The conceptual model of vicarious learning emerging from these findings (shown in Figure 1) emphasizes the critical role of interpersonal interactions as a primary site of learning, both by providing a liminal space for building an understanding of another's experience, as well as by providing a venue for formal structures (e.g., learning requirements) and shared practices (e.g., storytelling norms) to exert their influence on vicarious learning. Placing these interpersonal interactions at the core of my conceptual model of vicarious learning suggests several important features of my emergent theory. First, the model recognizes the fundamentally human nature of learning in organizations (Lipshitz, Friedman, & Popper, 2007; in contrast to existing perspectives which place the act of learning at the organizational or collective level; Simon, 1991), but also articulates that this learning occurs in the day-to-day verbal and physical interactions between individuals (Weick & Ashford, 2001). In doing so, the model is open to individuals' learning of practices, skills and routines ("know-how") as well as more cognitive acquisition of knowledge ("know-that;" Weick & Ashford, 2001). Moreover, by emphasizing interpersonal interactions, the model is rooted firmly at the relational level of analysis, suggesting a potential mechanism for how vicarious learning links individual and collective learning processes. Indeed, others' experiences can serve as an input into individual-level cycles of action and reflection (i.e., experiential learning processes; Kolb, 1984), providing an additional concrete experience upon which to reflect and develop more abstract generalizations that inform the individual's future actions. Likewise, individuals' sharing of experiences with one another enables more collective learning (i.e., a change in collective response sets; Sitkin, Sutcliffe, & Weick, 1998), as these learning interactions move learned content into a shared domain (i.e., into collective memory; Walsh & Ungson, 1991), outside of a single individual's mind. This allows the learning to outlive any particular individual and contribute to collective

adaptation and structural change, providing a mechanism for explaining collective responses to future environmental changes (Bailey & Barley, 2011; Weick & Ashford, 2001). This bridging role of vicarious learning is demonstrated in Figure 1 by the placement of these interpersonal learning interactions at the intersection of individual and collective learning cycles.

In this way, my conceptual model also strongly emphasizes the organized context in which these interactions take place, advocating a multi-stage, process-oriented view of vicarious learning. Specifically, consistent with prior perspectives on organizing (Weick, 1979), this process of enabling, enacting and elaborating vicarious learning is attentive to the environment where this learning is enacted (learning context), the shared behaviors of actors in this environment (informal practices), as well as the overarching processes (formal structures) in which these behaviors are embedded. Below, I theorize more generally about the role of context and triggers in individuals' engagement in vicarious learning, then look backward (pre-interaction) and forward (post-interaction) from this central stage of the model to describe how formal structures and informal practices both enable and elaborate this vicarious learning, articulating mechanisms for how these actions influence individual and collective learning.

*****Insert Figure 1 About Here*****

Contexts and triggers. A key aspect of this process model of vicarious learning lies in the recognition of the role of designated contexts for engaging in vicarious learning interactions. Interpersonal learning interactions do not take place in a vacuum, and the selection of the appropriate time and place for these interactions (e.g., the use of downtime to tell stories) is thus critical to understanding how they promote learning in organizations (Connell et al., 2004). This role of physical and temporal context has been under-appreciated in prior work, which has tended to assume that learning interactions unfold during actual task performance (such as in communities of practice Brown & Duguid, 1991), or left the issue of context of interaction unaddressed (as in much work on knowledge transfer; see Argote & Ingram, 2000). Yet as evident in this study, the context can play an active role in cueing vicarious learning interactions by surfacing latent individual knowledge (e.g., triggering a memory of a past experience), as well

as motivating participation in storytelling by serving as a shared signal of normatively appropriate times and places for vicarious learning interactions.

Theories of situated learning have stressed the importance of context (Lave & Wenger, 1991), arguing that learning from others occurs while the individual is engaged in the task domain – that is, while the individual is doing the task to be learned. However, this emphasis on the context of *doing* as the site of learning is somewhat restrictive, and as demonstrated by the flight team members studied here, there are often contexts of engaging in vicarious learning that take place away from the domain of task performance. Thus, rather than this more problematic triggering of learning (derived from the need to resolve a problem at hand; e.g., Orr, 1996), the conceptual model presented here suggests the presence of a range of other potential triggers of vicarious learning. While the identification of all of these potential “offline” triggers (i.e., those taking place outside of direct task performance) is beyond the scope of this paper, my findings suggest that these triggers can include another’s telling of a related story, tangible documents and case summaries (e.g., the charts documenting prior transports), or even seemingly unrelated background cues (e.g., the TV news reports described in Table 2). Indeed, Brookfield (1987, p. 26) defined a trigger event as any cue that created a sense of “inner discomfort and complexity,” suggesting that a variety of cues and experiences in organizations could prompt the confusion or curiosity necessary to trigger a vicarious learning interaction.

Enabling structures and practices. In addition to being rooted in context, interpersonal vicarious learning interactions are also influenced by efforts to enable individuals to participate in these interactions. These enabling actions span levels-of-analysis, and include more formal structures (such as the mandatory learning and staffing policies at Sigma Flight) as well as more emergent practices of individuals within Sigma Flight (such as promoting a shared learning orientation and conforming to storytelling norms). Though not an exhaustive list of such structures and practices, these enabling efforts observed at Sigma Flight played a key role in individuals’ more frequent and effective engagement in vicarious learning (relative to Gamma Flight team members). More specifically, these enabling structures and practices serve to

increase the collective learning capacity of individuals within Sigma Flight (i.e., absorptive capacity; Cohen & Levinthal, 1990), by establishing a shared language and baseline level of knowledge that facilitates the assimilation of new experiences into individuals' existing knowledge. Absorptive capacity reflects an individual or organizational ability to assimilate new information, such as experiences introduced by another party (i.e., "external learning"), as a function of ongoing "internal" learning efforts. The enabling actions described here, and in particular the formal structures of requiring ongoing independent learning and hiring individuals with greater intrapersonal expertise variety (Bunderson & Sutcliffe, 2002), thus ready individuals for vicarious learning by providing the rich and diverse pool of existing knowledge necessary to build absorptive capacity (Cohen & Levinthal, 1990). In other words, these formal structures guarantee that all team members are engaging in continuous learning of a broad variety of topics, which they can connect to their own breadth of prior knowledge, building the capacity of the entire team for engaging in vicarious learning.

At the same time, more informal actions individuals take can help enable individuals' vicarious learning by creating more attentive, heedful interrelationships between team members. Heedful interrelating refers to interpersonal interactions characterized by attentiveness, alertness and care, where individual needs are subordinated to a shared goal (Weick & Roberts, 1993), resulting in relationships where knowledge and experience are more easily shared between individuals (Styhre et al., 2008). Indeed, by establishing norms for interacting, as well as building individuals' willingness to participate in these interactions (by adopting a learning orientation), individuals are able to more attentively and alertly engage in vicarious learning, and are more likely to demonstrate mutual respect and care in these interactions (which increase interpersonal trust and psychological safety, further promoting their learning from one another; e.g., Edmondson, 1999). This heedful interrelating thus provides a mechanism for understanding how emergent enabling practices (alongside formal enabling structures) facilitates greater access to others' experiences, creating a relational environment where "everyone has something to teach

me” (rather than the defensive, “armchair quarterbacking” described earlier), helping individuals better incorporate others’ experiences into their own ongoing learning processes.

Elaborating structures and practices. Turning attention to what follows vicarious learning interactions, the conceptual model emerging from my findings recognizes the role of formal elaborating structures and informal elaborating practices in translating these interactions into enhanced individual and collective learning. Again, the formal structures (collectively reviewing cases in weekly grand rounds, and creating training scenarios) and emergent practices (adding directly to response repertoires and guiding future learning) that elaborate vicarious learning at Sigma Flight do not present an exhaustive list, but do suggest more general mechanisms for this elaboration. Specifically, by creating venues for developing collective consensus and implementing policy change (i.e., grand rounds), as well as tools for rehearsing responses to others’ prior case experiences (i.e., human-patient simulator scenarios), the formal elaborating structures displayed at Sigma Flight help build collective routines for future action and thus facilitate greater learning (Wilson, Goodman, & Cronin, 2007). These routines are not merely stable habits of action, but rather flexible tools that guide the initial approach to an experience before being modified and refined as they are used and re-used by different organizational members (Feldman, 2003). Exemplifying this mechanism of flexible routines, the clinical protocols at Sigma Flight provide team members a working guide (based on accumulated wisdom to date) for approaching a particular patient transport, but through interpersonal vicarious learning and subsequent review at grand rounds meetings, these protocols can be updated in response to a particular case, enhancing the collective’s readiness for addressing a similar case in the future. Additionally, these formal structures help team members develop a shared sense of collective efficacy, by making everyone aware of the cases that were transported, and developing rehearsed responses (e.g., through simulated scenarios) for addressing those cases in the future. Collective efficacy refers to a future oriented judgment about the group’s capability to execute a course of action to attain a goal (Bandura, 2000), and this confidence in

collective ability can influence how effectively individuals make use of prior learning in the face of a future challenge (Goddard, Hoy, & Hoy, 2004).

In terms of the more emergent practices that elaborate vicarious learning, these practices work through a mechanism of facilitating greater crystallization of learning at the individual level. Crystallizing refers to the challenge of internalizing a complex learning experience and articulating a tractable plan for future action (see Nonaka, 1994), and individuals are better able to crystallize their learning and transfer it to a future experience when they have opportunities to “follow-up” on their learning, such as by putting it into practice or connecting it to their prior knowledge base (see Argote & Ingram, 2000; Baldwin & Ford, 1988; Colquitt et al., 2000). The informal practices at Sigma Flight of incorporating techniques from others’ experience directly into one’s own response repertoire, as well as allowing others’ experience to guide subsequent independent learning, provide important opportunities for this follow-up and crystallization. Expanding one’s repertoire allows the individual to directly put what they learned from another’s experience into practice (either in a future transport, or in a simulation or scenario), while engaging in independent learning in response to another’s experience (e.g., looking up research articles on an illness that someone else transported) allows individuals to draw deeper connections between others’ experiences and one’s own base of knowledge. These elaborating practices (as well as the formal structures described earlier) thus allow vicarious learning interactions to serve as a component of individual learning cycles (i.e., of experience and reflection; Kolb, 1984) by facilitating individuals’ ability to internalize the learning stemming from these interactions and more readily apply it to their future experiences.

Contributions to the Study of Vicarious Learning

The results of this research elaborate and extend existing theory on vicarious learning in organizations in at least three ways. First, by focusing on the interpersonal interactions by which individuals learn from each other, I provide a micro-level perspective on vicarious learning in organizations, in contrast to the more macro-level perspectives offered in prior research. Indeed,

the vast majority of studies have been conducted at the unit- or organizational-level of analysis, examining how organizations (or organizational units) use the experience of other units or firms to enhance their own strategies and performance, emphasizing inter-unit linkages and structures as the key means of learning and knowledge transfer. Though these inter-unit and inter-firm vicarious learning often invoke interpersonal interactions (such as personnel rotation or board interlocks; e.g., Haunschild & Beckman, 1998) as an explanatory mechanism, an understanding of these underlying interpersonal processes (i.e., the specific actions and interactions by which vicarious learning occurs between individuals in organizations) has nonetheless remained largely omitted from this literature (Bresman, 2013; Darr et al., 1995; Styhre et al., 2008). As noted at the outset of this article, the simple presence of a potential conduit for learning and knowledge transfer (e.g., a personnel rotation program or a knowledge management system) is not sufficient to understand the emergence of vicarious learning between people at work. My findings revealed a conceptual model of these underlying interpersonal vicarious learning interactions, while also recognizing the important role played by collective-level structures, providing an opportunity to integrate prior findings into a more unified, multi-level theoretical account of vicarious learning.

The second contribution of the present research lies in its focus on vicarious learning as an organized, multi-stage process. The more macroscopic, structural approach of much prior research assumes (either explicitly or implicitly) that individuals will automatically learn from one another if provided the opportunity, neglecting to explore the actions and interactions by which individuals construct their practice of learning within these structures (such as developing distinct teaching-learning ecologies; Bailey & Barley, 2011). Studies that do examine individual-level vicarious learning have been either relegated to the training context (Taylor et al., 2005), away from the ongoing day-to-day learning, or is focused narrowly on the factors that make someone more or less willing to share (or seek) knowledge, rather than the actual process or outcomes of these vicarious learning interactions (e.g., Levin & Cross, 2004). By developing a three-stage model of how individuals enable, enact, and elaborate vicarious learning interactions, the findings of this study thus provide a rich procedural account of vicarious learning, revealing

this learning as a decidedly “organized” phenomenon (rather than a natural or haphazard process). Specifically, my conceptual model points to the role of mutually-agreed-upon context for interaction as a necessary (but not sufficient) pre-requisite for vicarious learning, while also recognizing how these interactions are triggered by various elements in the learning environment and are further supported by “upstream” and “downstream” structures and practices (that reflect the confluence of both formal and informal elements of the organization; McEvily et al., 2014). Indeed, the observation that Sigma Flight’s ability to rely on vicarious learning as a core strategy stemmed more from the presence of these enabling and elaborating actions (rather than differences in how each team actually engaged in interpersonal vicarious learning interactions) underscores the importance of this nuanced, procedural view of vicarious learning.

A third contribution of this study arises from air medical team members’ enactment of vicarious learning as focused on peer-to-peer discussion and analysis of rich experiences. Though vicarious learning at the individual level has traditionally been conceptualized as the simple observation and imitation of others’ behavioral scripts (Bandura, 1977; Manz & Sims, 1981), the findings presented here demonstrate that individuals engage in vicarious learning outside of their direct performance of observable actions (a required condition of traditional theories of vicarious learning). Instead, vicarious learning in these teams occurs through reconstructing experiences in narratives told during “downtime,” with an emphasis on back-and-forth discussion and development of mutual understanding, rather than simply imitating others’ observed actions. This discursive, experience-based view of vicarious learning also helps distinguish it from related constructs, such as advice seeking or knowledge sharing, which tend to focus more on the transfer of (typically codified) information across groups (e.g., Argote et al., 1990; Argote & Miron-Spektor, 2011), rather than on the mutual discussion of both tacit and explicit elements of experience. Indeed, flight team members distinguished their engagement in vicarious learning with peers from other learning activities (such as seeking expert advice or information), helping demonstrate the unique benefits of the more discursive process of vicarious learning: it allows team members to learn in the face of significant ambiguity and equivocality in

the application of knowledge, while these other learning activities can address only the simple lack of information (i.e., uncertainty; Weick, 1995).

Additional Contributions and Future Directions

Beyond these contributions to the vicarious learning literature, the results presented here also advance the study of narratives and stories in organizations. Though there has been a long-held interest in understanding how narratives contribute to learning within organizations (Garud et al., 2011), much of the literature on narratives focuses on “non-core” stories (see, for instance, the typology developed by Martin, Feldman, Hatch, & Sitkin, 1983 that emphasizes stories such as “Is the big boss human?”), leading some to claim that “critical skills, including deep knowledge of a content domain, would be very difficult to transfer via stories” (Swap, Leonard, Shields, & Abrams, 2001, p. 103). This disconnect may have arisen from the fact that studies of narratives often emphasize the sharing of these stories as a tool for cultural reproduction, rather than learning (e.g., Dailey & Browning, 2014). Moreover, many studies view stories as only shared during task performance (cf., Orr, 1996), yet many work domains do not provide opportunities to take time during task execution to tell stories with coworkers. For instance, consultants’ stories of managing a difficult client presentation are unlikely to be discussed while they are actually delivering a client presentation (in the way Orr’s repairmen sat in front of a dysfunctional machine telling stories). Indeed, as Bechky (2006) has noted, sharing stories has been criticized as a “quaint” approach to learning in the face of modern organizational challenges. The results presented here may thus advance studies of learning from narratives in organizations by re-focusing attention on elements of the story performance (i.e., Boje, 1991), such as the location of storytelling interactions (e.g., storytime and storyplace; Connell et al., 2004) or environmental elements that trigger these interactions, in order to develop theories of learning from narratives in “offline” contexts that may be more relevant in modern organizations.

This offline, discursive approach to vicarious learning highlights several practical implications of these findings for a variety of organizations. Organizations in a variety of

industries are facing challenges similar to those of air medical transport teams – engaging in increasingly knowledge-intensive work, and frequently encountering ambiguity in determining how best to apply knowledge to the delivery of products and services. Given that prior theories of vicarious learning reflect the high-volume manufacturing organizations of their origin (Tucker & Edmondson, 2007), they may not prove as tractable in this current ambiguous environment of learning in organizations (Noe et al., 2014). Having been developed in this modern learning environment, the process described here may thus reveal a more useful set of tools and techniques for promoting vicarious learning in organizations where “reinventing the wheel” is costly (Bresman et al., 1999). For instance, organizations might consider changes to meeting structures and project debriefs that better allow them to elaborate more informal learning that occurred during a project, implement structures that help build individuals’ capacity and heedful interrelating, or create designated spaces and times for promoting interpersonal learning. As an example of this latter approach, in a recent press release announcing their new corporate campus, Google described how the facility was deliberately architecturally engineered to maximize “casual collisions of the workforce,” in an effort to promote sharing knowledge, experiences and ideas across units (Lindsay, 2013).

Finally, though the context of air medical transportation is an unusual one, this extremity threw the vicarious learning process into sharper relief, allowing for the development of richer, more nuanced theoretical insights than would have been allowed in a milder context (Bamberger & Pratt, 2010; Eisenhardt, 1989). Nevertheless, future research will need to more fully address the generalizability of this framework to other contexts. For instance, researchers might explore how this process of organizing for vicarious learning unfolds in virtual work teams (e.g., Martins, Gilson, & Maynard, 2004), or other environments where interpersonal interaction is more limited. Future work that more systematically examines the proposed relationships and mechanisms in the emergent theory presented here would also offer a meaningful extension of this work. Indeed, the rich, qualitative data and inductive approach employed here was suitable for the paper’s goal of developing theory in an underexplored domain (Golden-Biddle & Locke,

2007), and answered recent calls for greater qualitative, meso-level attention to learning practices in organizations (Noe et al., 2014), but was nonetheless unsuitable for explicitly testing the causal relationships proposed by this theory. Finally, the structures and practices used to enable and elaborate vicarious learning that emerged from my analysis represent only an initial foray into these concepts, and there are likely many other structures and practices that enabling and elaborating vicarious learning. Future research is thus warranted to develop more complete taxonomies of these formal structures and informal practices, and might reveal additional mechanisms for their effects on vicarious learning.

Conclusion

When it comes to caring for patients who present with extreme injuries or illnesses that require rapid transportation to a major hospital, “trial and error” is typically the least preferred method of learning. Observing the work of air medical transport team members revealed that learning in this critical context is often a function of “the stories we tell,” reflecting an emergent, organized process of vicarious learning from discursive interactions about others’ experiences. These insights thus facilitate the development of a multi-stage theoretical process model of vicarious learning, demonstrating how these interpersonal interactions occur amidst a confluence of formal structures and informal practices that enable individuals to engage vicarious learning, guide their enactment of storytelling interactions, and elaborate the learning that emerges from these interactions. The result is an understanding of how individuals organize for vicarious learning, allowing the lessons of others’ experiences to impact individual and collective learning and guide future performance.

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TABLES & FIGURES

Table 1. Differing Learning Approaches at Sigma Flight and Gamma Flight

Theme	Evidence
<i>Interpersonal Learning Efforts at Sigma Flight</i>	<p>Rounds started way back when ... and it's always been something that we've done. Not every program did it. I remember going to some of the big national conferences years ago and talking about our weekly grand rounds and people would look at us and say, "Do what?" ... It was very helpful and other programs didn't do that. ... I think people are upping their game, so to speak, and they do a lot more as far as education and participation with those kinds of things now. But we've always done those. (Sigma)</p> <p>It's helpful to share your experience with somebody else who's been through it or is here to do the next one, because they can give you feedback - feedback from each other at this level. It is very, very helpful and it's also very informative. (Sigma)</p> <p>So going in [to Sigma Flight for the first time], and just sitting there, and just hearing them dissect cases, and talk through the molecular level of what was going on and stuff, was definitely intimidating. ... [In other units], you would get a really strong nurse here or there, that would be able to do a little, but not anything like what you would see around this kind of group. ... I can't say that I have ever really gone through and reviewed a lot of cases ... [at my prior job], they would have rounds, so your attending [physician] and your residents and nurses would go through and round on your patients, [but] again, there's mostly doctors running it. The nurse would be like, "yeah, the patient pooped, the patient is eating fine" – nothing really medically based. ... Coming in [to Sigma Flight], everybody is throwing in their input, you know, you're talking about these really sick patients, everybody is throwing in their ideas, what they might have done, what they thought went well, [putting in] that group effort on it. (Sigma)</p> <p>[Talking] informally ... with the crew and say, "Hey, how did that turn out? Tell me how that progressed?" Because some of the stuff we do is cool. ... That's why I go to rounds too, it's like it'd be nice to know how that [aortic] dissection [patient] did, or whatever else, because I could be there tomorrow. I could walk into that hot mess tomorrow and [learning] how to diffuse the situation better - that's tough. [So] I think that's a huge part of my learning process. I mean the day that [listening to others' cases] stops being fascinating is the day you probably should go work in the spine clinic. (Sigma)</p>
<i>Independent Learning Efforts</i>	<p>So after we have staff meetings all together, the Peds [pediatric] and Adult teams each go off and do their own education thing. So we'll have somebody</p>

*at Gamma
Flight*

come in and give a lecture or an update on a procedure or illness or something. Like last week we had the guy come in, because we are now a regional stroke center, and he explained the differences between a stroke hospital, stroke center, etc., and what we would be doing now with these stroke patients. It was good just to get updated on this stuff that is going on. (Gamma Obs)

Back in the day, we had binders. Each specialty - obstetrics, trauma, neuro - things like that, would have a section, and then we would put current articles in there. Articles that we found and researched, things like that. However, with the way electronic media and everything is going, we don't do that anymore. ... One of the best things we have ... is the UpToDate website that, if [a flight team member] has a question, say they ... see a pre-eclampsia [patient], they could look up pre-eclampsia on that site, and it gives a whole list of articles to read. They could research and I get the homework with that to follow up on. (Gamma)

Personally, I read, read, read, read. I keep up with the trends outside of air medical [practice]. ... You really have to know what's happening in the [broader] industry - medicine in general. I keep up [because] I read New England Journal of Medicine. ... I'm always on the AAPA [American Academy of Physician Assistants] web site and AMA [American Medical Association] web site. There's always something out there that we might think about in a different or say, "Look, this is what's coming down the pike." ... You don't want to ever be behind. As an individual I don't want to be behind. I also want to have the people I work with or the people I work closely with to go, "Hey, look, this is kind of what's trending. This is what we're looking at right now." [So, my learning strategy] is always reading on my own time, at work, textbooks. ... I probably have \$3,000 worth of just reference books that are sitting here in my house ... I like to be able to tell people a page number when they ask me a question off the top of my head. (Gamma)

We have to be self-motivated to do our own continuing education [and] go to conferences. There's a lot of on-line stuff now that you can do. ... You just have to go and search for all the specialty courses that apply to that certification ... There's really no other way. Most people tend to like going to classes more than on-line. I guess you get that personal attention when you go to a class. You can ask questions and stuff like that. [But online] it's always available. You can look online and there are courses all throughout the state for whatever you're looking for. (Gamma)

Note: "Sigma" = Interview Quote or Observation from Sigma Flight; "Gamma" = Interview Quote or Observation from Gamma Flight. Quotes from non-participant observations and informal discussion are drawn from detailed field notes, and are marked with "Obs." All names are pseudonyms.

Table 2. Enacting Vicarious Learning

Theme	Evidence
<i>Learning from Others' Stories</i>	<p>I think sometimes [hearing others' stories] can be like getting a traffic ticket. We're getting pulled over for going too fast. Sometimes you need a little reminder that you're driving over the speed limit and there are hazards associated with that. You don't get the ticket, but from that on for a while you're driving at the correct speed limit. The take away points that are there get reinforced. [It might remind you to] pay attention on every transport, because either ones that seem easy are not [going to be easy] or vice versa.... I think those are important take home points. (Sigma)</p> <p>As an example [two flight nurses] went out on a case where a guy ended up needing a surgical airway. It was sort of an airway disaster. He'd had a psychotic break and cut his neck. He had a neck injury and became increasingly stridulous [difficult, strained breathing]. He needed airway protection... it hit the fan and it got ugly for a couple of seconds it sounded like. During the retelling of the story, everybody puts their own spin on what possibly happened [sharing it during conversation]. I imagine myself in that situation. What decisions hopefully would I make that that would mitigate against that? I find real value in that.... that gets me thinking. I envision myself in that situation. I can see myself doing exactly that same, having the same reaction. (Sigma)</p> <p>[When you hear others' stories] you get this cringe because you've been there. A racecar driver could say, "I was doing 210 miles an hour around the third curve, and I began to get a little skid, and I heard my carburetor..." and every other racecar driver will go, "Oh, my God." To me, I'm like, "I don't understand." [But] if I walk in and say to somebody here, "Man, we went over to get somebody that had a beta-blocker overdose," everybody all of a sudden, could just really cringe and [say], "Oh, God. What happened?" That's what we hear in report, every morning, when you hear people report, they are trying to tell you, "We ran into this situation." ... I mean, it's like they already know what you are going to have to face, and when you begin to relate the story, you're working through what you did, and what they would do ...[and] you go, "Oh, okay, that's a great idea. I'm going to put that in my bag of tricks." ... You know, you're trying to figure out for your next time, when you run into that, what you heard - a little probe of wisdom, or a little way of doing something to help out. (Sigma)</p>
<i>Storytelling during Downtime</i>	<p>A lot of times we go in to an ER and it's a quick assessment, [and then] "let's go." You need to know what that drip is up there for, what the dosages of it are, what are the contraindications, do we need it, do we get rid of it? ... There's no time to sit and ask your partner a lot of things - it's quick. You go</p>

to a scene call and you've got to know what the hell you're doing, right now. ... That's why I do a lot of my learning when we get back; these were the vitals, these were the meds, these were the drips, this were the history, and then kind of put it all together afterwards because there's just no time out there. ... When you're like, "Whew! The patient is here [at the destination facility]" then you can tear the chart apart and look at the history and that kind of stuff and figure stuff out. [Then with] my partner, it's "Tell me why is this patient on this med or why did you start that med? Did you start it because of this or just tell me what you're thinking," because a lot of times you just can't stop to talk about that stuff at the bedside. (Sigma)

[Learning] is going to be not necessarily just in [formal] orientation. It's going to be just informal, sitting around having breakfast or sitting with your partner and hearing stories of transports past. In some ways that's instilling the experience or knowledge or lessons learned from those transports onto [others] in an informal way, which, (a) let's them know the potential for that crazy, unique, different transport that's out there, and that it could happen. Then, (b) they'll pick up on the strategies we employ to manage it. I never really gave it much thought, but just talking about it [now], I see that happen. I mean those stories are lessons in a sense. ... I think there's an educational component to that that goes unrecognized. ... I think everybody loves to share stories, and the job we do is unique so those unique circumstances occur and when there's a new person there, and you want to share with them what the job is like, [you say] "Well, let me tell you about this one transport I did. It was freaking crazy." [It could happen when you're] sitting around as you are bullshitting downstairs. At breakfast there seems to be a lot of stories passed on. ... Especially with [new team members on orientation] - going through this orientation stuff will elicit memories of transports that have happened in the past. ... It helps prepare people for the craziness. It helps prepare them for the unexpected, and it just shows them what's required. They see the decision-making, or how that transport went. (Sigma)

[Learning happens when you] come in the door, at breakfast and lunch, when we are sitting upstairs ... because it's more relaxed ... you are discussing, you are just talking about a case. ... It happens just sitting down here. I can't tell you how many times you're doing something and someone said, "Let me tell you about this case," and you sit back and you discuss it. ... Those incidental places, like walking in the door, because you have to, you report off, and usually you don't want to keep the outgoing shift too much longer with questions, but you get that information. (Sigma)

[There are a lot of issues that can be solved at the breakfast table, and learned about as well, through stories. We share a lot of stories with each other. I think there's value in that. ... If I had a bad day the other day or I had a good day or I did this or I did that. ... In my mind that's fairly valuable. A lot of people on the West Coast, the dot com people, will have lunch brought in for their

employees. Don't be fooled. It's not because they want to feed you, it's because they want you and I to sit down and yak over lunch and solve the world's problems. Same thing [here]. ... I think it's more storytelling at breakfast with some learning points, [whereas] it's more formal at rounds I think. It's more an informal [process of] me sorting through what I think are interesting stories to tell, versus "here's all the cases that we did [this week]" ... It's all about the stories really... I guess it's an informal way to go overall the trials and tribulations in a non-threatening environment. (Sigma)

Usually [sharing stories] could last us until eight o'clock. We do shift change at seven o'clock, so then it can last us until eight o'clock, and we [have scheduled] morning brief, so then we'll say, "OK, we're out, have fun, and have a good day. Bye." Then the conversation will just stop. It doesn't matter if you were in the middle of a sentence or not, that's the end of the conversation for the most part. Which is fine with all of us and we all kind of have that general understanding that if we're not hanging out for shift brief we need to go now - we've been here for 24 hours and now we're heading on out. (Gamma)

*Triggers of
Storytelling*

"Every time somebody does a chart, it's got to be reviewed by a co-worker and sent along the way before it gets processed. ... I'll look through it and I'll say, "Hey, we need to talk about this because that doesn't seem to be the way it should be," or people will [ask me], "Why didn't you give this medication sooner," or, "Why did this happen?" or, "Why didn't you do that?" A lot of times it's like, "Hey, we didn't have it available," or "We did it as fast as we could. The guy was trying to kick the window out." There's usually a logical explanation, [and] that's a lot of reason why they review charts, is to go through the thought process of *why* you did what you did. If you have good rationale for it, nobody's going to fault you. [They just want to know] what you were thinking, why you did what you did." (Sigma)

"It's so hard [to provide an example] because I honestly don't even know where to begin. There's so many. When an opportunity comes up to talk [about experiences], something will prod or poke my mind and it will jog my memory - "Oh yeah, I remember why we have this, this and this [equipment on board the aircraft] is because so and so didn't have it on the scene [of an accident]. ... It's [only] when something comes up that you go, "Oh yeah I remember."" (Sigma)

Once Dale finished the chart, they started talking about big accident scenes [prompted by the coverage of a large plane crash on TV]. Steve asked Dale, "Did you go to the crash where that little girl lived but everyone else died? Was that before your time?" Dale responded, "No, I wasn't at Sigma Flight then, but I went to it by ambulance. I have never seen anything like that." Steve responded, "Yeah, [one of the pilots] told me there were just body parts

all around.” [Conversation continued...] (Sigma Obs)

“That combative patient [looking at the news report on TV] reminds me of the time we had this PCP-addicted patient who was yelling and screaming at me...” (Gamma Obs)

*Storytelling
with Peers (vs.
other learning
strategies)*

I think talking to your partners, spending the first few minutes of a shift or while you guys are checking the helicopter, just to say, “Hey did you guys do anything interesting this week or your last couple of nights? What did you do last night?” If you get a pretty interesting case, [something] really cool or really different that you don’t see [often], you’re going to want to talk about it anyways. Who better to talk about it than your partner who understands whatever it is? I think you can learn some of that just by general conversation and talking to your partner ... The other piece that we get is when we do shift change, I will always ask the crew, “Did you guys do anything today?” ... “Okay, anything interesting?” That’s a good way at shift change to talk about some of the experiences from another crew. (Sigma)

When we get a really interesting case, there is a core group of people that will just say “Hey did you hear about that? Holy shit, this was crazy.” and we’ll just talk about it, and it’s a great way to learn. We’ll bounce things off each other - it is back and forth so I’ll ask questions ... to debrief yourself. We’ve all been on those horrific calls that just suck from start to finish and you want to talk about it with other people because you want to get ... you hopefully want to get a little bit of input from them on what they would do in the situation. (Sigma)

There’s a lot of, obviously there’s a lot of stuff that we have to keep up, certifications and all that stuff we have to do. [For] me, it’s constantly, with the new people coming in, we’re learning as they’re learning. ... It’s that next level of learning where [you] see one, do one, teach one. ... We’re going through it with [new staff members]. Protocols change all the time, so one of those things is, usually newer people are the smartest people. They bring a lot to the table; they keep you on your toes. Next thing you know, they’re teaching [you], they’re like, “the protocol says this,” and you pull up the protocol and you’re going through it with them. (Sigma)

“[It’s all just] talking about it [our prior cases] ... saying, “What in the heck? What did I miss? This is what happened.” ... We still have to mentor and foster each other because again, we don’t work in a calm, relaxing environment. You lose a patient or you lose a kid, those feelings don’t just sit at the door and walk away. They are there and nobody really gets it but your partner because they are the ones experiencing it with you. I depend a ton on my partners, my coworkers, for that. It’s not to say that my husband or my sister or mother can’t provide it. They can provide support but they don’t understand it - but my partner does.” (Sigma)

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Table 3. Enabling Vicarious Learning

Theme	Evidence
<i>Enabling Structures (Hiring Policies and Required Learning)</i>	<p>You kind of have to [have a generalist background] because this job essentially is the jack of all trades and master of none. We all come with past experiences. ... We all have our strengths and weaknesses and it's up to us to strengthen the areas where weaken and maintain proficiency and efficiency in the areas that we are good in. That's what we look for in the new flight nurse ... because you're going to be alone with them flying in the helicopter and it's just going to be you and that person responsible for one patient, you want to make sure that that person is strong as a clinician as they can be. (Sigma)</p> <p>...there's techniques that you use to help your partner get it [secure an airway] and that's why we have that consistent training is so that we can help do that, to complement each other when it becomes a difficult airway. Like with the bougie [a piece of equipment that helps orient the intubation tube] - holding the bougie up top [or] not letting it flap in the wind - because we've had that little bit of extra training here. [As another example,] the BURP [Backward, Upward, Rightward Pressure] method [for intubating] was something that I learned day one that I was here; it was drilled down my throat by [other flight nurses], so whether if I went with Diana or if I went with Jake or if I went with Stanley, it will be that [shared practice]. (Sigma)</p> <p>It's the combination. It's every single person that has come in to this position, because like I said everyone has come from a different background. There is something to learn from every single person that comes in here, even the new people because they are fresh out of the ICUs, they are fresh from the bed side of sitting with a pediatric patient for 12 plus hours at a time. They know what they're doing when it comes to that particular patient. The problem is now they have to expand their horizons and take care of everything. That's our goal is to bring them up to speed. Everyone learns from each other. (Sigma)</p> <p>There were a couple things that I learned doing the simulator training, that I had no clue [about]. [The education coordinator] threw out a scenario, and I was like, throwing my hands up, "I don't know what the answer is," and then he said, "A, B, and C." I'm like, "God, I never thought of that." I'll never forget that. I went to somebody and I said, "Did you know that if you did this and that, and whatnot," and he goes, "Yeah, I had one of those in ER last week." ... and now he presents it in a scenario, and it's like, "Wow, that is</p>

really great because I will never forget that." (Sigma)

So you have a crew of a nurse and medic, and between the two of us, we bring a range of experience. The nurse has the ICU experience and the medic has that street experience, so between the two of us we cover a really wide range, and it works nicely. So we each bring certain expertise that allows us to function, when you put us together, as a complete critical care unit. (Gamma Obs)

I have the same partner that I've worked with now consistently every single [week]. Give or take a couple of days here or there basing on schedule requests and that kind of thing, I've had the same partner on [that day] for the last two and a half years. We have a phenomenal system down. It worked very well for us and alleviates our stress levels. On the flipside of that, if you are continually paired with a partner ... who is not necessarily a strong partner, it makes work life difficult and you're constantly carrying the load. (Gamma)

*Enabling
Practices
(Storytelling
Norms and
Learning
Orientation)*

Oh, yeah. Yeah. Yeah. Well, absolutely. I heard you ... there's a case that just happened that I just sought out that person and said, "I heard about it, what happened?" Because I want to know where they went with it, where it went off the rails if it did, so that I cannot ... so I can prevent that from happening, mitigate it before it happens and or find a solution. I think you'll find that in just the sort of incidental conversations that you have when we're all sitting around at coffee in the morning. ... I think that's very healthy if you ask me, to be able to talk about those things, because everybody knows you don't have all the information. You're never going to have all the information, and all of us here know that 'I wasn't there.' For the most part, I'm not going to sit there and 'Monday morning quarterback' it because I wasn't there. It's a whole different world standing outside a Buick in 5-degrees cold trying to intubate, and sitting in rounds and talking about it. It's a different world, but virtually everyone, virtually everyone who's doing the talking has been there. It's like, "Okay, what happened?" When they say, "I'm sitting on [the highway] in the trunk of a Buick," you feel like, "Huh. I've never been in the trunk of a Buick, but I've been in the trunk of a Chevy, and I know what it's like when it's 5-degrees, I know what it's like when the tracheal tube is cracking in your hands, because it's freezing cold and the light is off. You just make all those relations right away. Boom. You can empathize with where they are at, and sometimes predict what would come next, if that makes sense. (Sigma)

I heard about a case the other day, I was actually teaching and one of the instructors that was teaching with me was like, "Did you hear about what [the Gamma Flight crew] had?" Yesterday I actually worked with one of the providers that was on that, and I was like, "Hey, I heard you guys had a really tough mission the other day with the four-month old." She was like, "Yeah, it

sucked.” ... She started talking to me about it, and then as she was talking to me about it we just had a discussion back and forth about it. I don’t think that she felt like I was going, “Well I can’t believe you did that.” That’s not what I was saying at all. I think you [have to] approach it from that aspect where you’re trying to learn from it versus always trying to feel like people are trying to critique you. I think people are so competitive up there [referring to the Gamma Flight office upstairs] because of the nature of what we do. They always feel like they have to show how much they know and if they can one-up somebody by catching something that they didn’t do, or that they should have done. (Gamma)

Although what we do is protocol driven, there are still some things that have to occur, decisions that have to be made that are difficult to be made. There’s a lot of responsibility that comes with the job which people need to learn about. They need to learn how to accept feedback as well. ... If you go out on a flight and you have a bad outcome or whatever then you need feedback on what you can do next time to have a better outcome for instance. You shouldn’t necessarily think about this as punitive. It’s done to bring you to a new standard. When we switched from nurse-doctor to nurse-nurse, when you went out with a physician, if there was a bad outcome it’s, “I’m the nurse, they’re the physician. It’s because they didn’t do something.” When there’s two nurses it’s like, “it’s us.” (Sigma)

Even though they weren’t there, everyone has a perspective to offer. What you choose to do with their perspectives is on you but everybody has something to offer you. When you listen, the more people we talked to about it, the more perspective I gained and the more reassurance I had because a lot of my coworkers, if not all of them would have done exactly what we did. ... I do think it is important to talk to them about things that you have gone through or things that you are going through in the moment. I think you learn best from each other that way. (Sigma)

None of us are okay with our level of learning. We still have more that we can learn. We just haven’t found the right thing that we need to learn yet, ... listening what went right and what went wrong, and then learning from what went wrong. Not everything’s going to go right, so we’ve got to learn what does work and what doesn’t work, and change it (Sigma)

That’s why I said I love flying with those guys because I know that I’m going to learn something every time we go somewhere. They’re also open to me teaching them some stuff. You have to have a certain amount of knowledge to come here. Even though I’m [one of] the newest flight nurse[s], there are things that I do know ... because I was a respiratory therapist before I was a nurse. [For example,] with these crazy ARDS patients and all this vent management that we’re doing, Stanley would be like, “Listen. I’m so glad that you’re here. Tell me what you’re doing, walk me through it. I need to learn it

from you.” It’s just cool like it’s a nice back and forth. ... It’s nice to fly with people who have a little bit of respect for what I did. You know what I mean? There are certain people where that relationship is more apparent ... If you’re not scared when the tones go off or if you think that you’re never going to learn anything and that you’ve got it all down pat, you don’t belong there. I don’t care if you’ve been here 20 or 30 years or 10 months, there’s something to learn from every flight. (Sigma)

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Table 4. Elaborating Vicarious Learning

Theme	Evidence
<i>Elaborating Structures (Weekly Rounds and Scenarios)</i>	<p>[If you are unable to transport a patient,] you immediately sit down with your partner and you walk through it, "What could we have done," and even before you leave the bedside. "Can you think of anything else? Did we do this? Did we try this?" Then you come back and when you're reporting ... where we thought we were successful, where we thought that it didn't help the case at all. Then it's brought up again at rounds to cover the case, just by virtue of the fact that it ... failed to be transported. "What did you do? How did you learn? What did you find?" There's a sense of relief on people's faces in the room because they think, "Whew. That's probably what I would have done," but somebody else in the room may go, "Why didn't you try this, or do another [test]?" It's a sense of, "I've been there before, maybe this would help." So, you review it. (Sigma)</p> <p>Rounds are really good as a consolidation of everybody’s comments, but on a day to day basis at the change of shifts, the night crew will tell me they did this flight last night. They went for a stroke patient or a patient with a dissection and they did this and this. You hear the stories and decision-making, the ideas and what prompted them to make the choices they did. I think that’s also very helpful. (Sigma)</p> <p>At shift change, you'll get [stories], because we always ask, "Where did you guys fly today? Where did you guys do?" And ... you'll hear, "Oh God, let me tell you about this one." You hear some interesting stories and then those stories get passed on and then rounds comes, [where] you'll hear it again play by play. (Sigma)</p> <p>A lot of times you might have changes to protocols based on a bizarre case. Let me give you an example. We went to [another hospital] to get a young kid who was last seen two days before, and he'd overdosed on heroin and bath</p>

salts and a whole bunch of other crap. We got there and the kid actually had a heart rate of 270; he was just really crazy. ... We straightened him around on the ventilator side ... and got his heart rate down somewhat. We got him back, and he was a handful for a while, but as a result of that, because I had the toxicology protocol, I requested [during rounds] that we review the algorithm to address tachycardia with cocaine and all these crazy drugs that kids are taking these days; how to address that particular piece of it... So if it ever comes up again, it's like, "Oh, yeah, we got that down here in the protocol. If this happens, you might consider these things." (Sigma)

What happens [when we review charts] they'll have the initial peer review and I might do the secondary peer review. I'm looking more for protocol violations, and then try to give feedback as far as just care issues for improvement. What I have to do is then, read the initial comments, see if those were addressed and then, read the chart again. Then, I kind of go through and pull things out. If I put in a QA response [a note on the chart, for the transporting crew to review further], maybe I note three things that need to be addressed, typically what happens is, one of them - the first one I put in - might get addressed. Then, from there on, that's it. [The others] gets missed ... because they'll go and look up that first thing that got a reference to the chart, and take some time to go do that, and then, they either forget or it just slips their mind to go back and see [the others]. (Gamma)

*Elaborating
Practices
(Adding to
Repertoire and
Follow-up
Learning)*

There was a discussion recently about THAM [tris-hydroxymethyl aminomethane, a medication given for post-cardiac arrest acidosis] and hypoglycemia [low blood sugar] - if you give THAM too fast, it can cause hypoglycemia. That's not part of my mental drug library of things to do; there's so many side effects, you don't always pick up on every single thing. And the older I get, the more difficult it is to keep all that knowledge in there and pull it out as readily. [So when a recent patient] got hypoglycemic because [the transporting flight nurses] gave THAM, and they showed up here with a [low] glucose, they were kicking themselves for not having picked up on that. And then the discussion was, "well, you gave them THAM, and one of the side effects of THAM is hypoglycemia." And I'm like, "Oh, wow!" You know? Live and learn, because I didn't realize that that was a complication from THAM. ...[So] from their mistakes, and their complications, I am able to put that into my arsenal of "Don't do that." (Sigma)

One of the things that I try to do, because one of my areas that I am weaker in would be airways, I try to come in and just do a quick RSI [rapid sequence intubation] on the mannequins, just to practice my technique. [It's] being prepared for the fact that I may get an airway that night. The one thing I have learned throughout the years and a couple of my partners have taught me this is listen, there is an airway, it's just a matter of finding it. ... Both bases have

the mannequins with the equipment lying there. We did that purposely because that is one of the areas that many people call us for is advanced skilled airway techniques. (Sigma)

In education, it's not that you're all smart; education teaches you where to find the answers. That's the same thing with what we do. The experience will build you and make you stronger, but half the battle is knowing where to find the answer. In these right here [holds up cards], I've got cheat sheets in here that have been laminated, I couldn't tell you how many times. These are over 15 years old and they are my cheat sheets for ... everything. (Sigma)

If you just pay attention, you can pick stuff up pretty easy... like the snake bite [a previously discussed case where other flight nurses had transported a poisonous snakebite patient], I've see one snake bite in 22 years of being a nurse. I probably should know something more than I do about that, and we have so many electronic resources. It's two clicks away. Any weird pathology is about two clicks away. (Sigma)

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Figure 1. Organizing for Vicarious Learning at Sigma Flight

