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Storytelling as a Tool for Vicarious Learning among Air Medical Transport Crews

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Abstract

Learning vicariously from the experiences of others at work, such as those working on different teams or projects, has long been recognized as a driver of collective performance in organizations. Yet as work becomes more ambiguous and less observable in knowledge-intensive organizations, previously identified vicarious learning strategies, including direct observation and formal knowledge transfer, become less feasible. Drawing on ethnographic observations and interviews with flight nurse crews in an air medical transport program, I inductively build a model of how storytelling can serve as a valuable tool for vicarious learning. I explore a multistage process of triggering, telling, and transforming stories as a means by which flight nurses convert the raw experience of other crews' patient transports into prospective knowledge and expanded repertoires of responses for potential future challenges. Further, I highlight how this storytelling process is situated within the transport program's broader structures and practices, which serve to enable flight nurses' storytelling and to scale the lessons of their stories throughout the entire program. I discuss the implications of these insights for the study of storytelling as a learning tool in organizations, as well as for revamping the field's understanding of vicarious learning in knowledge-intensive work settings.

Keywords: learning, vicarious learning, storytelling, hospitals and health care, knowledge management, groups and teams

As organizations engage in knowledge-based work that is increasingly complex and dynamic in its execution (e.g., relying on globally dispersed teams, virtual work, and disruptive employment technologies), the need for employees to continually learn is ever more pressing (Noe, Clarke, and Klein, 2014). Yet learning based solely on one's own experience is likely to falter in these interdependent and diverse work settings, where unusual experiences are frequent (Garud, Dunbar, and Bartel, 2011) and tasks require varied knowledge that any one person or team is unlikely to accumulate from direct experience. This

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limitation of learning solely from one's own experience lies at the core of enduring interest in understanding *vicarious learning*—the process by which individuals update their knowledge or repertoire of future potential responses on the basis of others' experiences rather than only their own (Bandura, 1977; Manz and Sims, 1981; Myers, 2018). A significant body of organizational research has focused on how vicarious learning enables the transfer of knowledge and diffusion of practices across employees in different teams, units, or sites within organizations (e.g., Ancona and Caldwell, 1992; Darr, Argote, and Epple, 1995; Argote and Ingram, 2000; Bresman, 2010, 2013).

To date, this literature has generally assumed that vicarious learning in organizations occurs either through a process of observing and imitating actions taken in other groups (consistent with similar work at the organizational level of analysis; e.g., Haunschild and Miner, 1997; Baum, Li, and Usher, 2000; Madsen and Desai, 2010) or through the use of organizational systems for capturing and disseminating the lessons of others' experience (Alavi and Leidner, 2001; Argote, 2015). Yet the nature of work in today's knowledge-intensive organizations has rendered many of these assumptions untenable (Bresman, 2013; Myers and DeRue, 2017), leaving our understanding of vicarious learning out of step with the realities of work in modern organizations (as much of the literature focuses on more stable, low-uncertainty work contexts; see Greve, 2020). With many organizations employing increasingly dispersed teams engaged in highly specialized knowledge work, employees are less able to directly observe the actions and outcomes taken by their peers in other teams—or to easily document, retrieve, or learn from others' project summaries and articles in knowledge management systems.

Therefore, I explore the practice of *storytelling*—an interpersonal interaction wherein two or more people (i.e., a dyad or small group) converse and interpret experiences (Boje, 1991)—as a felicitous tool for vicarious learning in a variety of work organizations. Storytelling seems well positioned to address the challenges of vicarious learning in modern work highlighted above, as stories ''register, summarize, and allow reconstruction of scenarios that are too complex for logical linear summaries to preserve'' (Weick, 1987: 125). As Bechky (2006: 1757) noted, though some have tried to characterize storytelling as an antiquated form of knowledge sharing in modern, knowledge-intensive organizations, in the face of ''an economy dependent on the flow of information and on knowledge workers for innovation . . . it becomes even more important to understand when, where, and why workers tell stories in organizations.''

Extant research, however, provides little guidance on the process by which storytelling can serve as a means of learning vicariously from others' experiences at work. Much of the literature on storytelling in organizations emphasizes how stories can communicate identity, cultural values, or leaders' strategies (see Dailey and Browning, 2014; Vaara, Sonenshein, and Boje, 2016) rather than how these stories are useful for communicating task-relevant knowledge or insights for accomplishing complex work. Moreover, when stories are explored as a means for learning about others' work experiences, they tend to be invoked in static, simplified, or abstract ways—often focused on the notion *that* stories are valuable for learning rather than exploring *how* storytelling unfolds to impact learning. For instance, research has examined whether different story content (e.g., others' successful or failed outcomes) influences learning but has given far less attention to the dynamics of how

storytelling is enacted among employees (e.g., alongside other learning-focused practices and structures) to share lessons from others' experience in different teams or units.

I present a qualitative exploration of how storytelling is enacted as a tool for vicarious learning across teams of flight nurses in an air medical transport program—healthcare providers who work in two-person fluid teams (''crews'') to transport patients via helicopter from smaller hospitals or accident scenes to a large, tertiary-care center with greater capacity to care for patients' injuries or illness. Drawing on ethnographic observation and interviews with flight nurses, I develop a conceptual model of how they use interpersonal storytelling as a distinct strategy for learning from other crews' transport experiences to prepare themselves for challenging future transports. I also explore how this storytelling is situated among broader structures and collective practices that both enable these interpersonal storytelling interactions and scale the emerging knowledge to reach all members of the program. These insights contribute to the literature on vicarious learning in organizations by articulating how others' experiences can be transformed, through the storytelling process, into prospective knowledge and expanded repertoires of responses to future challenges—in contrast to models of vicarious learning as the simple adoption or adaptation of existing knowledge. Moreover, I advance the study of storytelling in organizations by identifying and describing a multistage process by which stories can be used to share core, task-relevant knowledge. Finally, I extend prior work by incorporating a cross-level perspective on this vicarious learning process, attending to how the vicarious learning occurring between teams through these interpersonal storytelling interactions is enabled and scaled by collective-level structures and practices.

STORYTELLING FOR VICARIOUS LEARNING

The interpersonal telling of stories or narratives can facilitate sensemaking and sensegiving in organizations, providing a basis for developing shared meanings and understandings of an experience (Sonenshein, 2010; Garud, Dunbar, and Bartel, 2011).[1] As Weick (1995: 61) noted, ''a good story holds disparate elements together long enough to energize and guide action, plausibly enough to allow people to make retrospective sense of whatever happens, and engagingly enough that others will contribute their own inputs in the interest of sensemaking'' (see also March, 2010). Moreover, stories serve as a surrogate for individuals' own experience in ways that provide information and implications for future action (Sole and Wilson, 2002; Martin, 2016), making them valuable for learning from others' experiences, as evident in studies of ''war stories'' and other narratives as tools for training or imparting wisdom, particularly to newcomers (e.g., van Maanen, 1973; Weick and Roberts, 1993; Orr, 1996).

But while storytelling played a central role in early studies of knowledge workers, such as Orr's (1996) ethnography of situated storytelling among

[1] I follow much extant management scholarship in using the terms *story* and *narrative* interchangeably to refer to ''thematic, sequenced accounts that convey meaning'' (Barry and Elmes, 1997: 431), though I note that others have argued for more specific usages, recognizing that stories are only one form of narrative present in organizations (see Gabriel, 2000).

photocopier repair technicians as a means of sharing knowledge and solving problems, greater attention has been given to more abstract, generalized, and formal notions of knowledge transfer in subsequent research on learning in work organizations, with less attention to storytelling (Bechky, 2006). Moreover, much of the attention that has been given to stories has been in practitioner-focused outlets and communities, drawing on the findings of the early studies described above to articulate the value of stories for sensemaking and sharing tacit or social knowledge as a means of spurring action and change in modern organizations (e.g., Sole and Wilson, 2002; Denning, 2004; Brown et al., 2005). Over time, these trends have resulted in a proliferation of varying interpretations of the role of storytelling for learning in organizations, ranging from a view of stories as key mechanisms for developing wisdom and sharing solutions to technical problems (e.g., Brown et al., 2005), to an appreciation of stories' ability to capture and carry tacit knowledge but a skepticism of their value for transferring critical or deep knowledge (e.g., Swap et al., 2001), and even to a dismissal of stories as ''quaint'' or irrelevant in the context of modern organizations (e.g., Davenport, in a 2006 interview cited in Bechky, 2006).

There are at least two key limitations of extant research on storytelling in organizations that give rise to this confusing array of conclusions and inhibit the field's understanding. First, this literature has tended to focus less on stories about the enacted ''mechanics'' of work (i.e., the dynamics of completing work tasks) and more on stories of the felt ''meaning'' of work (i.e., the values, goals, or identity ascribed to work). Much of the research on storytelling in organizations has emphasized the role of stories as vehicles for communicating organizational culture, history, and norms rather than task-focused knowledge (see, for instance, the typology developed by Martin et al., 1983, that emphasizes stories such as ''Is the big boss human?''). This literature has focused on how employees navigate questions of identity (e.g., ''This is who we are'') and values (e.g., ''This is why we do it this way'') as they listen to, tell, and retell stories at work (Dailey and Browning, 2014). Such research has no doubt yielded important insights on the role of stories in organizations (see Vaara, Sonenshein, and Boje, 2016, for a review). It has highlighted, for instance, how employees can use storytelling to imbue organizational routines and practices with meaning and agency (Chen, 2012), how stories about different organization members (i.e., low-level or high-level members) upholding or violating organizational values can influence newcomers' behavior (Martin, 2016), and how the narratives shared by organizational leaders can aid in coordinating and sustaining an organization's disparate efforts to innovate (Bartel and Garud, 2009) and provide legitimacy for entrepreneurial ventures (Garud, Schildt, and Lant, 2014). But despite these contributions, this research provides relatively little insight into the role of storytelling in task-focused vicarious learning, i.e., learning how to better perform work based on the outcomes achieved by others.

This relative imbalance in the focus of storytelling research (prioritizing the meaning over the mechanics of work) is exacerbated by a second key limitation of prior studies: they have tended to take a fairly static, simplistic, or abstract perspective. Much of this research is interested primarily in *stories* rather than the process of *storytelling*, focusing in particular on the effects of exposure to differing story content on learning. These studies tend to examine how presenting a static story (i.e., a written text or audiovisual narration of a story)

that varies on some key characteristic, such as the degree of the protagonist's failure or success, affects individuals' learning-related motivation and performance (e.g., Joung, Hesketh, and Neal, 2006; Bledow et al., 2017; Quinn et al., 2021). Though informative about the types of content that prompt learning, these studies contribute less to our understanding of how interpersonal storytelling practices influence learning in organizations, as they reduce the role of stories to unidirectional transmission vehicles for (often experimentally manipulated) content differences. As Boje (1991: 107) observed, this sort of approach renders stories ''wrenched from their natural performance contexts'' in ways that fail to ''capture basic aspects of the situated language performance, such as how the story is introduced into the ongoing interaction, how listeners react to the story, and how the story affects subsequent dialogue.''

This second limitation of existing research is also evident in the fact that much of this work arises in theoretical (rather than empirical) research, which inherently takes a more abstract, decontextualized view of storytelling processes. For instance, while developing a theoretical model of coactive vicarious learning, wherein a model and learner co-construct an understanding of a model's experience through discussion and joint processing, Myers (2018) noted storytelling as one potential form these vicarious learning interactions can take but focused on articulating a more general dyadic conceptualization, with less attention to understanding the processes and implications of storytelling for learning from experiences arising in other settings (e.g., in other teams or units) at work. Similarly, Garud, Dunbar, and Bartel (2011) theorized how organizations can harness a narrative approach to more systematically learn from unusual experiences—through a process of organization members attending to and telling others about unusual experiences, transcribing (i.e., preserving or formally recording) and analyzing texts of these narrated experiences, and accumulating and reading these texts (across members, time, and contexts) to generate action and sustain organizational learning. Though this theoretical framework illuminates the potential value of a narrative approach to learning in organizations, it does not address the underlying dynamics of how this storytelling unfolds as a situated practice for learning about and making sense of organizational work tasks.

Advancing Storytelling for Vicarious Learning in Modern Organizations

As organizations grow and employees work in increasingly dispersed (geographically or virtually) teams or units, it is more difficult to observe the actions and outcomes of others in different teams/units—or even others within an employee's own team/unit (see Hinds and Bailey, 2003). This renders observational, modeling-based approaches less useful for facilitating vicarious learning. Work in knowledge-intensive organizational settings also increasingly draws on ambiguous, tacit knowledge that is difficult to record in formal repositories, as this knowledge is embedded in action and context (Nonaka, 1994) and is hard to document in generalizable terms that would be useful for someone else's learning in a different context (Barley, Treem, and Kuhn, 2018). This limits the value of formal knowledge transfer conduits as vicarious learning tools across teams. But these characteristics of low observability and high ambiguity, which can derail other methods of vicarious learning, provide a fertile context in which to tell stories as a means of learning from others' experiences at work. Stories

can contain multiple interpretations and capture tacit knowledge (Browning, 1992; Connell, Kleįn, and Meyer, 2004), and the process of storytelling invites both the teller and listener(s) to play active roles in the discourse and construction of meaning (Boje, 1991), conveying lessons of experience in ways that preserve nuance, ambiguity, and complexity. Moreover, as they engage in storytelling, a teller is recreating their experience through engagement with a listener, providing the listener an opportunity to understand and draw lessons from that experience despite not having directly observed or participated in it. Through these discursive storytelling interactions, individuals are able to recount and analyze past experience to draw nuanced, multifaceted insights (Myers, 2018) in order to develop the requisite variety (Weick, 1979) necessary to better meet future work demands. The potential value of individuals' engagement in storytelling interactions to learn vicariously from experiences arising elsewhere in their organization (i.e., the experiences of colleagues working on other teams) merits a more thorough exploration in order to advance the field's nascent knowledge of storytelling as a tool for vicarious learning in modern work.

METHODS

I used inductive, qualitative methods to explore the process of storytelling for vicarious learning in a setting that exemplifies the challenges highlighted above: the work of flight nurses in an air medical transport program. Qualitative methods are suitable for exploring process-focused phenomena in organizations, especially where extant theory may need reinvestigation or modification (Edmondson and McManus, 2007). Moreover, given that vicarious learning in work environments involves the interplay between individuals' behavior and contextual structures and pressures, qualitative methods can address the full range of the phenomenon, as they lend themselves to exploring individuals' meaning-making while also capturing the dynamics of the context and exploring a phenomenon in its natural setting (Maxwell, 2005).

Context

The air medical transport industry certainly reflects an extreme context (Hällgren, Rouleau, and de Rond, 2018) but one that is useful for illuminating practices that promote vicarious learning in the face of ambiguous, complex work that is difficult for others to observe. Healthcare providers generally face highly complex and uncertain work (Nembhard and Tucker, 2011), so in this context continuous learning is a necessity and learning vicariously from others' experiences may be particularly helpful (see Roberts, 2010).

In air medical transportation, healthcare providers (the ''crew'') not only provide rapid transportation but also 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 the patient's outcomes. Across the industry, aircraft are typically crewed by two healthcare providers (as well as a pilot) who are responsible for the treatment and transportation of patients assigned to them. This work arrangement restricts crews' ability to directly observe others' work; crew members cannot observe, in real time, the care provided by their colleagues working on other crews (i.e., at other times or at other ''bases'' or

geographic locations). Moreover, the cases that crews are called upon to transport are relatively infrequent and non-routine (compared with the work of healthcare providers in other settings), and patients transported by helicopter are, on average, more severely injured and require more medical resources than patients transported by ground ambulance (Desmettre et al., 2012). These features weaken crew members' ability to rely on direct experiential learning as a means of developing and improving their performance. As a result, the potential impact of learning from other crews' 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 and Pratt, 2010: 668).

Site. The site for this study was an air medical transport program I call AirMedPro, which operated as a unit within a large university-based, tertiary care (specialized treatment) hospital in the United States.[2] At the time of this study, AirMedPro transported approximately 1,300 cases per year, which consisted primarily of interfacility transports (i.e., moving patients from smaller community hospitals to the university hospital or another tertiary-care facility) but also included scene transports (i.e., responding directly to the scene of an accident to transport a patient to a hospital). The program transports patients primarily using helicopters, with two helicopters in service at two different base locations 24 hours a day. One base was located at the university hospital, and the other was at a small airport approximately 30 miles away from that hospital. The airport base also housed a jet that was available for longer or more specialized transports, such as organ transplant team transports.

Crew and shift structure. In most U.S. air medical programs, crews consist of one flight nurse and one paramedic (Loyd, Larsen, and Swanson, 2020). In contrast, AirMedPro has a generalist staffing structure that requires all medical crew members to be dual-licensed as both nurses and paramedics. During the period of my study, the program employed approximately 20 flight nurse/paramedics (hereafter ''flight nurses''), who worked in two-person crews for a 12-hour shift at one of AirMedPro's bases (along with pilots, who were employed by a third-party aviation company). Some flight nurses work primarily day shifts, some primarily night shifts, and the remainder (typically newer flight nurses) work rotating schedules that include both day and night shifts. All flight nurses are expected to work shifts at both the university and airport bases, providing full-time (24/7) coverage for both bases.

These two-person crews are not fixed, i.e., crew partners are not permanent. Instead they reflect a ''fluid team'' in which a crew consists of two flight nurses working together temporarily (generally for the duration of a single shift) to accomplish their work before handing off to the next crew at the end of the shift (similar to emergency medical crews; see Akşin et al., 2021). On a given shift, a flight nurse thus sees and interacts not only with their partner on that particular crew but also the outgoing and incoming crews at the same base

[2] The names of the organization and of all individuals are pseudonyms.

(i.e., at shift changes occurring at the beginning and end of the shift, respectively), as well as potentially interacting with the crew working at the other base during the same shift hours (either by phone or in person). Outside of their shifts, flight nurses also communicate remotely with one another (e.g., by phone, e-mail, or text message) and might see and interact with one another incidentally while engaging in other work for the program, as well as during weekly ''grand rounds'' meetings during which cases are reviewed by the entire program staff.

A typical shift involves a variety of tasks performed at the base, including completing paperwork about prior transports, working on continuing education requirements, discussing prior cases, and practicing techniques, as well as eating and resting. Shifts involve two flight requests on average, which can come at any time and generally require immediate attention and response from the crew. Crews 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 in the area, which others (e.g., traditional ground ambulance crews) are unable to transport due to a lack of equipment, training, or expertise. This puts a significant amount of pressure on flight nurses 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.

Data Sources

I was afforded extensive access to AirMedPro's operations by the program's leadership, allowing me to gather detailed, rich data from multiple sources, including shift observations and semi-structured interviews with flight nurses, as well as informal observation of a variety of program meetings and events. Program leaders also gave me access to a range of internal and external documents, including training materials and protocols that facilitated my observations and understanding of learning in these contexts.

Ethnographic observations. My first source of data was ethnographic participant observation of AirMedPro crews as they performed their daily work routines, gathered in two distinct phases. In the first phase of data collection, I conducted approximately 120 hours of shift observations at AirMedPro, beginning with initial orienting observations (to familiarize myself with the roles and routines of the setting) and continuing with a series of formal shift observations, riding along with a crew of flight nurses as they completed their work. I immersed myself in the 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 crews' experience. Notably, some of my observation periods included portions of two different shifts, and I frequently observed past the end of a particular shift—both efforts that allowed me to observe handoffs between outgoing and incoming crews.

During these shifts, I accompanied crews through their daily routine, including their shift briefings, discussions, and other activities (e.g., meals, visiting patients in the hospital), as well as accompanying them on flights. During the treatment and transport of 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 I sat alongside the crew during transport. When flight nurses were not tending to a patient, I frequently engaged them in conversations, which enhanced my understanding of the setting and the events unfolding and also served as opportunities to engage in informal interviewing. I took written notes during these formal shift observations, including quotes from conversations with and among the crew, recorded as close to verbatim as possible whenever feasible. My presence as an observer did not seem to alter crews' behavior, as they were used to having a ''third rider'' on their flights because of the university hospital's program for resident physicians to fly with crews as part of their training. During my observations, I assisted crews with simple tasks, such as carrying equipment, which facilitated greater engagement and understanding between myself and the crews, reducing the potential tension of being observed while also creating opportunities to inquire about what was going on.

Beginning approximately 16 months after completing my initial observations, I engaged in a second phase of formal shift observations at AirMedPro that totaled almost 40 hours, and I conducted additional observations and interviews with members of another air medical transport program located in a different state. These interactions with an outside organization helped me refine my understanding of typical practices in the industry and develop a more robust conceptualization of the practices and behaviors occurring at AirMedPro.

In addition to the two phases of formal AirMedPro shift observations, I also engaged in informal, unstructured data collection efforts both during additional crew shifts and during AirMedPro's weekly ''grand rounds'' meetings, training courses, and other program events. This informal observation (beginning during the first phase of formal shift observations and continuing through my subsequent observations and the semi-structured interviews described below) totaled over 150 hours and provided more opportunities to not only observe AirMedPro operations but also engage in unstructured discussions with flight nurses.

In total, I spent over 300 hours observing or participating in AirMedPro activities, gathering data across several different time periods and from a variety of work settings (e.g., shifts vs. meetings). The result is a rich data set on the fundamental nature of these flight nurses' work that is unlikely to be unduly influenced by events unfolding at any one point in time.

Semi-structured interviews. After the two phases of formal shift observations, I conducted 19 semi-structured interviews with AirMedPro flight nurses and program leaders—17 with actively flying nurses and 2 with nurse managers who no longer regularly transported patients (totaling 12 men and 7 women)—regarding their work and learning at AirMedPro, lasting 55 minutes on average.[3] Given that learning is a personal, thoughtful process, utilizing interviews to generate rich descriptions from the flight nurses themselves granted me a window into their lived experience (Marshall and Rossman, 2010). Nurses received a small gift card for participating, and all interviews were audio-recorded and later professionally transcribed.

[3] The proportion of male nurses is generally higher in the transport nursing workforce than in other areas of nursing (Schumaker, Taylor, and McGonigle, 2019).

Data Analysis

Analysis proceeded in multiple stages, both during and after the different phases of data collection. As I conducted my initial phase of formal shift observations, I wrote field notes detailing my observations and emerging insights, and I engaged in frequent discussion and socialization of these emerging insights with other management scholars to test and refine my interpretations of the data and identify areas of interest. This process surfaced the concept of storytelling fairly quickly as a relevant, interesting technique used by flight nurses to engage in learning, an insight that shaped subsequent phases of data collection and provided a broad analytical frame. For instance, in subsequent observations and interviews, I focused attention on the practice of storytelling among flight nurses and how these stories were facilitated through various actions and structures. (I also retained broader questions so as not to excessively bias responses or preclude the recognition of other key concepts.)

After completing my semi-structured interviews with flight nurses, I engaged in further data analysis, following traditional approaches to grounded theory building (Glaser and Strauss, 1967) by using an iterative analysis process that began with a close reading and open coding of my field notes and interview transcripts to identify emergent themes and concepts. In this stage, it became clear that learning vicariously from others was an important and frequently mentioned part of flight nurses' broader set of learning behaviors at AirMedPro and that storytelling was a recognized action in their daily practice and interaction (though interviewees varied somewhat in the extent to which they overtly connected storytelling to learning). Guided by this frame, I grouped the themes and concepts emerging from the data into initial categories based on their commonalities (Corbin and Strauss, 2008). For instance, interview responses and field note excerpts focusing on the role of maintaining certifications, engaging in required simulations, and attending AirMedPro's weekly grand rounds meetings were grouped together as reflecting ''formal learning structures,'' whereas data emphasizing the motivation for, learning value of, and process involved in telling stories were grouped as part of a category focused on ''learning from stories.''

From these categories, I began to focus on theoretically relevant insights and organize them into preliminary models of vicarious learning through storytelling at AirMedPro (Locke, 2001). For example, as I cycled between my data and extant theory, I began revisiting my initial categories regarding learning from stories to more clearly delineate the specific procedural elements involved in storytelling interactions, such as the notion that storytelling could be triggered by various environmental cues and that listeners played prescribed roles in the process of telling and interpreting the lessons of stories. Moreover, my review of existing theory demonstrated that much of the literature on storytelling in organizations focuses on stories as vehicles for conveying values or norms, not core skills or knowledge. As my data seemed to indicate the use of stories as a core learning strategy at AirMedPro, I began focusing more deliberately on the relationships between my data and categories focused on the enacted process of storytelling and those focused on other practices or contextual features that influenced flight nurses' learning, such as the formal learning structures mentioned earlier. I thus expanded my conceptual framework to articulate how these elements impacted storytelling and its ability to serve as a

core learning tool in this setting. In doing so, I paid attention to whether these elements seemed to sit ''upstream'' or ''downstream'' of storytelling interactions, ultimately organizing my findings into a process model of storytelling for vicarious learning that reflected the specific behaviors involved in the storytelling process as well as the broader structures and practices that supported this process as an organized, valuable learning strategy at AirMedPro.

I continued to iterate between theory and data, refining my interim conceptual models through repeated reading of notes and transcripts, feedback from colleagues, reviewer comments, and engagement with relevant literature to develop a framework that articulated a potential contribution to this theoretical domain (Miles and Huberman, 1984; Locke, 2001) while not doing ''undue violence'' to my observations and experience (cf. Pratt, 2000: 462). In this way, my analysis reflected an iterative, multistage process of categorization ''moves'' (Grodal, Anteby, and Holm, 2021): identifying, merging, and relating different categories of data emerging from my observations and interviews; sequencing these categories based on their temporal and contextual dependencies; and ultimately stabilizing them into a framework that could address the conceptual puzzle of how storytelling seemed to be useful as a core learning strategy in this context (in contrast to extant theory). Finally, at multiple points throughout the analysis process, I had discussions with key informants and AirMedPro leaders to further ground my findings in the reality of this environment and reinforce my emerging interpretations (Glaser and Strauss, 1967; Pratt, 2000).

FINDINGS

Analyzing my data revealed a multistage process at AirMedPro of triggering, telling, and transforming stories of transport experiences as a tool for vicarious learning that was embedded in a set of collective practices and structures that helped enable and scale learning from these stories. To organize my inductive findings, I first briefly describe the nature of flight nurses' work as part of a crew, then articulate the process model of storytelling as a tool for vicarious learning that emerged from my findings, and finally turn to an analysis of how this process is enabled and scaled by particular structures and practices within AirMedPro.

The Experience of Air Medical Transportation

The environment crews face is one of intense ambiguity coupled with a high degree of isolation and independence. Flight nurses have a great deal of technical knowledge, but their work requires them to decipher often conflicting cues or signals to determine how best to treat and transport a patient. The learning challenges for flight nurses often stem from the degree of ambiguity in the cases they transport—the need to decide how to treat a patient in the face of uncertainty and equivocal information, and to do so without the access to other clinical experts and knowledge resources that would be available in a hospital setting.

For instance, I observed the transport of a patient who had been diagnosed at a small community hospital with a myocardial infarction (MI): a heart attack.

En route 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 be 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 that would require different and somewhat contradictory treatments. Over the flight intercom (activated through a microphone in each crew member's helmet, which the patient is unable to hear), one of the flight nurses said, ''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.'' 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.'' The need to make treatment decisions in the face of ambiguous symptoms is one of the key challenges for flight nurses, encouraging their engagement in continuous learning, as one flight nurse noted:

> 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, [and] 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. [4]

Storytelling for Vicarious Learning at AirMedPro

To accomplish ongoing learning in the face of this challenging work, flight nurses consistently described making efforts to learn vicariously from others' experiences as a supplement to their own direct experience, utilizing their interactions with peers as opportunities for vicarious learning and development:

> We do [at AirMedPro], I don't know, 1,000, 1,200 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 learn that way from somebody's example versus just reading what it is in a textbook and what they may look like.

Another flight nurse said, ''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 efforts to learn from others' experiences occur against a backdrop of other forms of learning that flight nurses undertake to prepare for the work of transporting patients. Flight nurses engage in a wide variety of formal learning strategies including didactic sessions and surgical skills trainings, as well as a range of self-paced studying and review efforts. They are expected to stay current on a wide range of information and be competent in a broad set of skills, most notably indicated by the maintenance of advanced, specialized

[4] Unless otherwise noted, quotes are from participant interview transcripts. Descriptions of dialogue from my observations are noted as such and are presented as close to verbatim as possible. Some quotes have been edited slightly for clarity, to provide definitions of medical terminology (in brackets), or to disguise a mentioned name.

nursing certifications. As one flight nurse noted in response to a question about what efforts are needed to stay on top of the knowledge needed at AirMedPro:

> We have to maintain certification in [at least] one [domain], and what I opted to do was sort of bounce around a little bit. I took the CEN [certified emergency nurse] test and passed that, and I thought well I'll try something else when that expired, so I did the CCRN [critical care nursing certification] test and passed that. Studying and preparing for those I think is of value.

Complementing these more traditional, independent learning methods, informal social learning interactions can surface lessons of others' experiences, providing additional knowledge and development opportunities. As the same flight nurse responded when asked a follow-up question about these learning efforts:

> **Interviewer:** If you had to say percentage wise, what percent of your learning is sort of informal versus formal?
> **Flight Nurse:** Oh God; 85/15.
> **Interviewer:** 85/15. With that 85 just being talking to other peers?
> **Flight Nurse:** Yes. And rounds maybe.

My analyses revealed that this informal vicarious learning is often enacted through storytelling interactions between flight nurses in which narratives of prior experiences are told, discussed, and analyzed. Storytelling provides a valuable—though not always formally recognized—tool for learning from others' experiences, as one flight nurse revealed in an interview response describing how to prepare new flight nurses for the work of AirMedPro:

> There's always something to learn. . . . I think we help prepare new people for that by passing on the stories of . . . all the crazy transports that have happened. That tradition of stories helps prepare people for that truly unique or different experience, but I think the only way you can really prepare for it is if you just know that potentially exists.
>
> . . . 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 sort of an informal way, which (a) lets them know the potential for that crazy, unique, different transport is out there, and that it could happen. And then (b) they'll pick up on the strategies we use [or] 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 don't think anybody thinks of them that way; they're just . . . sitting around telling gory stories or whatever, but 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 frickin' crazy.''
>
> . . . [It happens] sitting around as you are bullshitting downstairs. At breakfast there seems to be a lot of stories passed on. . . . But especially [for] the [new flight nurse] orientees . . . going through this orientation stuff [reviewing required material with an

> orientee] will elicit memories of transports that have happened in the past. . . . It's an unofficially recognized piece of the educational component of orientation I believe.
>
> . . . It helps prepare people for the craziness. It helps prepare them for the unexpected, and it just shows them what's required. They see in [someone's] decision making or how that transport [went] as they tell that story: ''this is what we did, and this is what [we were] thinking'' or whatever. . . . I don't know how important it is, but I think it's there. I think it's definitely there.

This extended reflection highlights how storytelling interactions among flight nurses can serve as a mechanism for transferring lessons from past crews' experiences to other flight nurses to prepare them for potential challenges in their own future transports. Since AirMedPro flight nurses rotate partners and work across both of the program's bases, these interactions between flight nurses on a shift together (e.g., during breakfast or downtime between flights) provide a forum for each flight nurse to share stories of—and lessons from—their transport experience on prior shifts (i.e., transports completed in a different crew). Notably, storytelling interactions at AirMedPro take place not only between the pair of flight nurses working on a particular shift (i.e., discussing past transports flown by one's shift partner) but also among small groups of flight nurses who might encounter one another during the course of a shift (e.g., interactions between the outgoing and incoming crews at shift change or interactions with flight nurses crewing the other base). Thus these episodes of storytelling may be dyadic or small-group interactions—which I refer to collectively as ''interpersonal storytelling interactions''—but always focus on the sharing of stories from a past crew transport experience to draw lessons that could be applied to future crew transports, serving as a vehicle for sharing knowledge and experiences across crews.

Interpersonal storytelling interactions about past transport experiences exist alongside a variety of other types of communication, including other types of stories or anecdotes commonly observed in organizational research on storytelling, e.g., complaints about interactions with management or stories about broader issues observed in the hospital. But I found that flight nurses view the interactive telling of stories of past transports as its own practice with a clear intention for learning and emphasis on the demands of performing a transport; it is distinct from other types of stories or interactions. Specifically, this shared practice of telling stories among peers allows flight nurses to recount both successful and unsuccessful elements of a transport and provide the necessary context and background information in which those actions were situated. The narrative format of these interactions allows flight nurses to convey the nuanced, tacit details of their experience, which are often the most important pieces for informing others' future treatment of similar patients. For instance, these stories not only convey clinical facts, such as how to administer an uncommon drug, but also provide a forum for discussing more subtle or implicit elements of the job, such as communicating with staff at a referring facility:

> I mean back to the other patient [a case in which the sending hospital had administered heparin, a contra-indicated drug for an aortic dissection] . . . I learned about that guy because [other flight nurses] 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? Because I've

> never given it, I've seen a bottle of it once. What can you do when somebody [at the sending 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.

Flight nurses frequently focused on these more tacit elements of others' transport stories that could be analyzed and used to inform their future actions, allowing these stories to serve not simply as tools for transferring stable clinical knowledge but as forums for expanding flight nurses' awareness of different approaches:

> I think that by talking about it and hearing the stories—first of all, it broadens your perspective. It gives you a perspective that there's more than one way to do things. Second of all, it helps you sort of in the problem-solving process because [they] may have encountered something that I haven't encountered.

Though this vicarious learning from stories of others' flights came to the fore in both my observations and interviews as a valuable learning mechanism at AirMedPro, what also became clear is that the process by which these stories are told is not automatic. My analysis revealed a multistage process model of storytelling for vicarious learning among these flight nurses, involving the *triggering* of the story of a particular experience by various cues, discrete norms and routines for *telling* stories, and recognized practices for *transforming* stories into prospective knowledge and responses for future patient care, as highlighted by the examples in Table 1.

Triggering a particular story of experience. As a result of flight nurses' inability to routinely observe others' work or easily obtain assistance from others when faced with an ambiguous issue during a transport, vicarious learning at AirMedPro is largely prospective (learning things from others' prior experiences that might be needed for some future transport) rather than problemistic (searching for a solution from others' experiences to a current, ''live'' problem). Whereas problemistic learning is cued by the need to resolve the current problem at hand, AirMedPro flight nurses rely on other mechanisms to trigger storytelling and learning during ''offline'' time, i.e., outside of the performance of a transport.

I found that stories of patient transport experiences can be triggered by the potential sharer of an experience or by someone who might desire to learn about another's prior experience, drawing on objects or actions in the environment that cue them to engage in learning. For instance, while the downtime between flights at AirMedPro provides an opportunity for storytelling, the telling of a particular story is often triggered by one flight nurse's review of the corresponding ''chart''—the documentation of a transport. Charts provide an overview of the actions and events of a transport (e.g., medications administered, patient vital signs at regular intervals) and can trigger storytelling and learning by making someone aware of another flight nurse's experience and cueing them to ask about it (e.g., during their next shift working together). The learning benefit of others' transport experiences often lies primarily in why they engaged in particular actions (i.e., their decision-making processes) rather than what they did, and although charts provide documentation of what occurred, they often do not describe the underlying reasoning or decision-making

Table 1. Additional Illustrations of Triggering, Telling, and Transforming Stories

Dimension / Theme	Representative Illustration
Triggering Stories	
Utilizing structural triggers	''Every time somebody does a chart, it's got to be reviewed by a coworker 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?''
	''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.''
Responding to ambient triggers	''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. . . . It's [only] when something comes up that you go, 'Oh yeah I remember.'''
	''You hear bits and pieces of it [details of a past transport], and then if it piques my interest, or there are unusual events, then I'm like, 'Tell me about that. How did that happen?''
Telling Stories	
Recognizing time and place for storytelling	''I think at the bedside that's a lot harder because there's not much time for just jaw jerking and storytelling. . . . That's not usually the time for that. 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, sitting around sharing war stories, type of thing.''
	''We share a lot of stories with each other. I think there's value in that. . . . I think it's more storytelling at breakfast with some learning points. . . . I guess it's an informal way to go over all the trials and tribulations in a non-threatening environment.''
Maintaining norms for telling and responding to stories	''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 different world, but virtually everyone, virtually everyone who's doing the talking has been there.''
	''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.''
Transforming Stories	
Analyzing stories via peer discourse	''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 . . . you hopefully want to get a little bit of input from them on what they would do in the situation.''
	''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.''
Incorporating stories into repertoire	''During the retelling of the story, everybody puts their own spin on what possibly happened. I imagine myself in that situation. What decisions hopefully would I make that . . . would mitigate against that? I find real value in that . . . that gets me thinking. I envision myself in that 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. . . . 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.''

processes. Thus a chart does not capture the complete story of the transport but serves as a starting point for learning from another crew'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.

Using the chart review process to trigger storytelling interactions for vicarious learning highlights how these triggers are often structured directly into flight nurses' workflow and standard routines. Yet these triggers are not limited to just cueing interactions between the two flight nurses working together on a particular shift; some triggers prompt storytelling between flight nurses on different crews as they encounter one another through the shift structure at AirMedPro, in particular at shift change. Shift handoffs have long been recognized as sites of knowledge exchange in hospital settings, but these exchanges typically focus on transferring information about a particular patient to the oncoming staff who will be caring for that patient. At AirMedPro, the oncoming flight nurses are unlikely to interact with a patient transported during a previous shift, but this time is still utilized for sharing the outgoing crew's experience.

The shared practice of telling stories at shift change was evident throughout my observations, even when circumstances changed normal shift times. For instance, while I observed a night shift (which typically runs from 7:00 p.m. to 7:00 a.m.), a scheduling conflict resulted in two nurses changing shift at 3:00 a.m. Despite the oddness of the hour, when they conducted their shift handoff, they engaged in a lengthy discussion about a prior transport immediately after the oncoming nurse's arrival, as an excerpt from my field notes demonstrates:

> 0250: Phil arrived. As he entered, Eric took off his headphones and told him, ''We didn't do much tonight, just had the balloon pump [transport] earlier.'' Phil responded, ''Did Andrew tell you about our guy who turned purple [a prior transport of a patient who had serious difficulty breathing]?''
>
> Eric asked, ''Did he have a pneumo[thorax]?'' Phil replied, ''No, he was just having trouble, he all the sudden was complaining of pain breathing.''
>
> Eric asked, ''How far out were you guys?'' Phil responded, ''About 5 minutes out . . . pilot asked if we wanted to hot offload [unload the patient without stopping the helicopter rotors, in order to save time], I looked at Andrew and we said 'yeah, let's do it.'''

This interaction, which continued as the two flight nurses discussed the details and implications of Phil's experience, was not related to any particular issue that Eric needed to alert Phil about for the upcoming shift. Rather, the act of changing shift prompted this interaction by triggering Eric to bring up the transport he and his partner had flown during that shift. Interestingly, the interaction quickly shifted to analyzing and making sense of a different story (of Phil's prior transport). This demonstrates how certain stories can be told in response to others (i.e., with one story triggering the memory of another story in someone's mind), in addition to being triggered by the shift change itself (which reliably cued stories from the outgoing shift).

In this way, though structured triggers (particularly shift change) frequently initiate the telling of particular stories, stories can also be triggered by other actions or elements in the work environment, including a story that someone else told or even something mentioned in passing in the background. These more ''ambient'' triggers are less predictable but serve as similar cues or interruptions that cause flight nurses to recall particular stories of past experiences to share and discuss. For instance, during one shift, I observed two flight nurses working silently on documentation (each on their own computer) with the television on in the background. When a TV news reporter began discussing a recent plane crash, one flight nurse asked the other about a plane crash that members of AirMedPro had responded to in the past: ''Did you go to the crash where that little girl lived but everyone else died? Was that before your time?'' The other nurse responded, ''No, I wasn't at [AirMedPro] then, but I went by ambulance. I have never seen anything like that.'' The conversation continued for a few minutes about the challenge of managing a chaotic scene and the clinical issues responders faced at the crash scene. This experience had occurred many years prior and might not have been brought up otherwise, but it was triggered as a topic for discussion and learning by the television report. In this way, triggers served a critical function in the storytelling process, helping flight nurses draw from a broad pool of latent experiences to select one to recount in an interaction.

Telling the story of an experience with others. While different structural or ambient triggers can cue a particular story (drawn from flight nurses' pool of past experiences), AirMedPro flight nurses rely on shared norms and practices for the actual *telling* of stories, which allows these interactions to more reliably serve as a tool for vicarious learning. For instance, AirMedPro flight nurses demonstrate a clear, mutually agreed-upon sense of the appropriate time and place for telling stories and engaging in vicarious learning. While the structural triggers of storytelling (i.e., shift change) inherently indicate when storytelling should occur, these shared norms for when and where stories should be told extend more broadly and cover when storytelling is *not* appropriate as well. Because of the time pressure facing flight nurses when treating a patient, they generally do not engage in storytelling interactions during their actual task performance, i.e., during the flight itself. Instead, the norm is to engage in efforts to learn and gather knowledge from others during designated downtime between flights. My interviews with AirMedPro nurses revealed that many feel they learn just as much in informal downtime interactions with colleagues as they do from gathering direct experience through transporting patients. One nurse described how flight nurses learn from each other even on days when an entire shift passes without receiving a request for a transport (versus 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 coworkers [than] had you gone on four flights.

Flight nurses also share a common sense of place for storytelling, with many of these interactions occurring in a small area of the university base, just inside the helipad entrance, where crews complete certain tasks, such as restocking supplies for the aircraft after dropping off a patient. This space tends to be where incoming and outgoing flight nurses meet for shift change and engage in their handoff. Other story spaces include the program's weekly grand rounds meetings (described below), as well as interactions at the meal table, with several flight nurses referring specifically to mealtimes as venues for learning and telling stories:

> [It's when you] come in the door, at breakfast and lunch, when we are sitting upstairs . . . 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.

In addition, flight nurses described a variety of shared values, norms, and practices for engaging in the actual telling of a story. In general, storytelling is a recognized and admired skill among flight nurses, as this quote about a former AirMedPro flight nurse indicates:

> 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.

At the same time, flight nurses described how storytelling interactions follow a set of informal rules distinct from, though informed by, communication norms in other settings (i.e., when working in a hospital nursing unit or as part of an EMS crew). As noted earlier, flight nurses are often more interested in the storyteller's thought processes and decision making than in the discreet values of clinical parameters. Yet, nurses' prior experience in hospital nursing units often teaches them to present only objective values and test results. As a result, the practice of recounting the story of a flight (e.g., ''presenting'' the transport at the weekly grand rounds meeting) is something that new flight nurses must learn:

> Coming in and presenting, and doing it in an open environment in front of your peers is very challenging. And it's very intimidating. . . . 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.

These informal rules for sharing stories of past flights further reveal a sense that flight nurses have a responsibility to share their stories with others, particularly stories of transports that did not go as well as expected. Though stories of bad outcomes might be more difficult to admit to others (relative to stories of very positive outcomes or ''great saves''), flight nurses expressed a normative sense that these stories need to be told:

> We are not perfect, and there are going to be things that we can do much better, and there are going to be mistakes we have made. But we have to learn from them, and the way we learn best from it 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, 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 [where] we could have done something differently or we should have done something differently or we could have done better, because that's how you learn.

There are also emergent rules and norms for how flight nurses should *respond* to the sharing of others' stories and experiences—particularly how to engage productively when other flight nurses share stories of mistakes or bad outcomes. Though the listener often has similar experiences that provide a basis for interpreting the story or asking questions—and providing thorough feedback on others' flights is normatively desired—flight nurses described a shared understanding that this feedback is best delivered with the recognition that the listener "wasn't there" (as noted in a quote in Table 1). The norm is for listeners to offer feedback on and reactions to the experience in a way that acknowledges the complexity of a storyteller's experience and that listeners are offering feedback in hindsight, without the pressures and stresses involved in the transport.

When listeners approach the story with this sort of empathy for the storyteller's experience, the interactions are often more conducive to further discourse and learning. The norms for responding to stories, combined with the shared belief in the need to tell them, thus help to ensure a level of safety and mutual respect that allows individuals to feel more comfortable sharing the full range of their experience, including their thought processes and potential mistakes or difficulties, enabling more learning. As the flight nurse quoted above continued when describing presenting at rounds:

> I think we have done better with not approaching it like "What were you thinking?" but saying, "Okay, I see that you went to pressure control and this, this, and this. Was there a reason why?" Just trying to pick their brain versus telling them that they were wrong . . . because I may think [your decision is] wrong, but your rationale may totally prove to me that I was wrong.

Storytelling interactions can break down due to a breach in the informal rules, such as when a listener strays beyond this normative ideal of constructive feedback and begins "armchair quarterbacking"—second-guessing or excessively criticizing—a storyteller's experience:

> My patients are kind of my patients to dissect. Somebody else's, you['ve] got to be careful you don't step on their toes. . . . 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.

The presence of shared norms for both telling *and* listening to a story of a transport experience underscores the role of discourse and back-and-forth interaction in the storytelling process at AirMedPro, providing a central mechanism for transforming a story into prospective knowledge for future transports.

Transforming a story into prospective knowledge and future responses. The performative elements of the storytelling process—the use of commonly accepted story times and places and the adoption of learned

storytelling and listening norms—guide the telling of a particular story but do not guarantee that anyone will learn from it. Rather, the telling of a story creates the opportunity for flight nurses to further discuss and make sense of it in order to *transform* it into future-relevant knowledge or expanded repertoires of responses they could later apply. Given the uncertain nature of flight nurses' work, their focus in learning from stories of other crews' experiences is less on solving some particular problem at hand and more about arming themselves with a broader set of tools, concepts, or techniques to apply if they encounter a similar situation in the future. By actively analyzing or debating the potential meaning of a story, flight nurses can convert its specific details and context into more robust guidance for future action when faced with a relevant situation (as seen in the quotes in Table 1).

In this way, flight nurses do not simply adopt or mimic the actions taken by the crew in a story. The discursive nature of storytelling interactions instead provides a forum for drawing more nuanced conclusions, such as by comparing the story to some other set of experiences (contrasting it to listeners' own prior experiences) or using the story as a stimulus to inform further learning efforts. Indeed, the emphasis on telling stories to help understand why flight nurses engaged in certain actions (rather than just reviewing documentation of what they did) highlights the importance of discursive analysis and collective sensemaking in these interactions. Active engagement from both storytellers and listeners is required to jointly analyze past experiences to generate prospective knowledge. Flight nurses frequently described how this two-way discourse and engagement from listeners in a storytelling interaction were necessary to generate an opportunity for learning:

> I also think it's two-way [communication]. I think if you're not interested in what I'm saying, then [the shift handoff 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. "Did the tube go well? What's the SICU [surgical intensive care unit] like today? Did they have their act together? Did they not?"

Discursively processing the story of a past experience this way is beneficial not only to listeners but also to storytellers. These storytelling interactions create opportunities for the storyteller to develop a better understanding of their own experience, rather than just imparting lessons of that experience to the listener. In interviews, flight nurses revealed how telling their own transport stories to their peers—including both more senior colleagues and newer flight nurses—provides a means for gathering input and debriefing themselves on their experience:

> As far as when you're telling a story, it's kind of 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're hopefully going to get a little bit of impact or input from them on what they would do in the situation. . . . Again nobody is out here to come to work to do anything bad or to fail; we're all here to try to succeed. And if I could do something better, I certainly would like input.
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> . . . About half [of the flight nurses] 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, [but] I've never done an ECMO [extracorporeal membrane oxygenation] transport, not one. Russel [a newer flight nurse] has done 6 in the last 2

> months. Even James, who's still on orientation, has done an ECMO transport. I just have never drawn that ECMO straw.

Although flight nurses might learn from simply telling the story to others, i.e., as a means of organizing their own thoughts about what happened, the quote above highlights that the engagement and feedback from listeners is often an essential part of learning from telling stories. Gathering input, advice, and mentoring from peers who can relate to the ambiguity and complexity of conducting a transport allows flight nurses to get feedback on the full range of a transport experience: the clinical, social, and emotional elements of flying a patient.

> I'm really good at . . . calling somebody [about my transport] and 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. [If] 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.

Telling the story of a transport experience to other flight nurses is an opportunity to gather additional perspectives, insights, or even just reassurance in dealing with the most challenging elements of the job.

This opportunity to engage with peers in detailed discussion and analysis of a past experience through storytelling interactions thus helps flight nurses (both listeners and storytellers) build robust, multifaceted knowledge that can inform their future work. However, flight nurses often noted that they did not learn ''automatically'' from these discursive storytelling interactions; they had to take active steps to learn and improve their potential responses for future transport challenges. One way that flight nurses described learning from others' stories was by consciously adding a technique or treatment to their repertoire that another crew had used successfully—or removing a technique from the repertoire if another crew found it to be unsuccessful. In other words, flight nurses viewed other crews' experiences, and the behaviors others described enacting in their recounting of a transport experience, as techniques or tools to add to their mental ''toolkit,'' expanding their range of potential responses available to be applied in a future transport. This repertoire revising occurs during all learning, but when flight nurses learned from other crews' stories, they often spoke of making deliberate efforts to update their repertoires. Whereas one's own experiences may automatically update a repertoire of skills (as the first quote below notes), when considering others' experiences, flight nurses had to be more intentional, such as creating tangible artifacts to incorporate the lessons of others' experiences (as indicated in the second quote):

> 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, [so] 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 [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, ''Oops, not going to do that.''

Beyond introducing new ideas or skills that a flight nurse might not have encountered before, stories of others' transport experiences can also encourage the review of existing knowledge in ways that help build an individual's repertoire for responding to future challenges. In this way, others' experiences present a vicarious audit of one's familiarity with a given topic, inspiring learning:

> [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 [another flight nurse] about the HeartMate II [a model of a ventricular assist device] they transferred, what I heard was, ''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]. These 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?''

Directly observing the transformation of others' stories into a flight nurse's own knowledge or response repertoire is challenging, as the future tasks for which this learning prepares flight nurses may or may not arise for any particular individual. Nonetheless, flight nurses reported relying heavily on knowledge gained from stories of past experience as a critical resource for decision making and patient care. As one flight nurse noted when describing how she used existing knowledge to better handle a challenging transport and decide what to do:

> [Sandy and I] went out and flew a burn [patient]. [A] couple weeks prior to that, Sandy and Steve did a burn [transport] where they had to cric [perform a cricothyrotomy] and did the IOs [delivering fluid via intraosseus infusion]. . . . So when we went on this burn, it's like immediately, ''I'm going to do airway, I don't want to cric, and we're doing IOs.'' My partner and I communicated what the plan of action was. We had things drawn up. It was probably the best scene call that we've ever done. . . .
>
> I think having [Sandy and Steve] talk about [their burn patient flight], discuss it—what went well, what did not go well, what they would have done different—is enough to stick in your head [and say] ''That sounds good, I will try to do that the next time, or keep that in the back of my mind.'' Like [Steve] said when he put the IO [drill] through the burnt bone, that it was harder to go all the way through it, but it still worked. It still went in.

In this case, the other crew's experience, shared through discussion and debriefing of the story of their flight, informed this flight nurse's thinking and

planning for transporting a burn patient, providing not only a reminder for what to consider (i.e., the difficulty of airway management and fluid access for burn patients) but also an updated repertoire of responses for things that could happen (i.e., how to use the IO drill differently on burnt bone).

As a further example of the ways in which flight nurses transformed stories of others' experience into prospective knowledge and repertoires for action, I traced the ways different flight nurses described learning from one story of a flight that occurred around the time of my interviews—the transport of a patient who had been bitten by a venomous snake. This kind of transport is rare for AirMedPro and requires flight nurses to mobilize a number of infrequently used resources—most notably, obtaining anti-venom—making this flight an especially valuable one from which others could learn. This example came up in several interviews, as well as in informal meeting observations and discussions (such as in the exchange below, which I observed during one of AirMedPro's weekly grand rounds meetings), allowing me to explore its impact for multiple flight nurses:

> **Medical Director:** Oh, I'm glad we're going over this one. I was really interested because I have never treated a poisonous snakebite before.
>
> **Flight Nurse:** Yeah, it was interesting. The only way I knew what to do and how to get ready was that at my old program, we had flown a guy who kept a couple snakes as pets and got bitten before, so I was familiar with how to do the anti-venom and everything.
>
> So the story was, the guy was playing with his friend's pet snake who he told him was defanged, so he picks him up and it was fine, then he wanted to pick him up later again and it bit him. So, we got there and [his arm] was all swollen all the way up to the shoulder, and we just had to give the anti-venom and fly him back quickly . . .
>
> It was interesting, because pharmacy didn't want to give me the anti-venom, and I had to explain to him that we could reconstitute it in flight, and that we knew what to do with it. That's the most complicated part, and they have to be careful with it because the anti-venom is hard to get, and it is really expensive—like thousands of dollars per dose and you need several doses.
>
> **Second Flight Nurse:** You know that reminds me, remember about 15 years ago or so, we had a guy who had gotten bitten a couple times by his poisonous snakes, and so the university was actually out of anti-venom. You remember that?
>
> **Medical Director:** Oh yeah, that was when I first got here.
>
> **Second Flight Nurse:** Yeah, I remember because we got called to fly to [another hospital] to pick up more anti-venom, and they came outside to the helicopter, brought us the anti-venom, and we jumped back in and came back. It was justified because they needed it so quickly. That was a weird flight.

This exchange highlights several elements of the storytelling process identified earlier that allow flight nurses to develop knowledge and responses for their future transports. The scheduled review of this case triggered the recounting of this story and also the subsequent recounting of a related transport experience (from another flight nurse), which helped to identify and refine a key

insight from the story—that anti-venom is not only essential but also precious (so valuable that the use of the helicopter simply to go pick up more is justifiable), and so flight nurses should be prepared to act quickly and potentially deal with resistance to obtaining anti-venom on a future flight. The story also highlights the complexities of administering anti-venom, which is likely an unfamiliar piece of clinical knowledge for many flight nurses. (Indeed, the flight nurse involved in the transport describes his own familiarity as stemming from a story of past experience at a former organization.) The story provides an impetus for other flight nurses to review this material, transforming the story of this particular case into knowledge about what to do in the future, as this flight nurse described when asked about learning from others' flights:

> Like this snake bite thing. . . . I know nothing about snake bites. So how do you give this anti-venom? And how do you mix it? And where do we get it from? . . . Is that where we can get it from—the zoo? How am I supposed to know to get it from the zoo? But [I can] go out and [ask others], ''Hey, tell me about this, and what are the side effects? And what do you do with that? And how do you know what kind of snake it was, you know?'' . . . Because [the flight nurse that flew the patient] had flown out in [another state] or whatever, he knew about it. He had experience with it. But I know nothing . . . I would be clueless! . . .
>
> But now I know I can call the ER pharmacist, and they can tell me what [anti-] venoms we have, and they mix them for you, and they tell you how to deliver them. So the next time, I'd be like, oh, maybe before I get in the helicopter and go, I need to go upstairs and talk to [someone], and be like, ''Hey, this is the snake, do we have it here? Or do I need to stop by the zoo?'' I learned a whole lot. . . . At least to know what questions to start asking. I wouldn't know what the dose of anti-venom is, but I know where the resources are to find some of those answers. And I know the right questions to ask.

Though this flight nurse says there was ''a whole lot'' to learn from the story of this transport, the learning did not result simply from hearing the story. Transforming a story into actionable insight or prospective knowledge requires effort—whether by engaging in more in-depth discussion or analysis, or by engaging in additional, independent learning efforts, as evident in another flight nurse's description of learning from the same story:

> [For example,] the snake bite thing. I've seen 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. I think in this age, I think that's probably where I learn the most. . . . I mean UpToDate tells you everything you need to know in about four paragraphs about the whole disease process. Fantastic.

Reinforcing this active, effortful practice of learning from stories of others' experiences at AirMedPro, another flight nurse contrasted it with the perception that other organizations don't consider such learning necessary or valuable:

> But [at] other programs, I think they're okay with their level of learning. Just like ERs in other places, if they're okay at their level of learning, that's okay for them, but I think what's special with all of us here is, 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. So like that snake bite, now we're all very intrigued by that,

> listening [to] 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.

A multistage process of storytelling for vicarious learning. Figure 1 presents an integrated view of my findings, showing that the use of storytelling as a tool for vicarious learning at AirMedPro involves a complex, organized process of triggering, telling, and transforming past crew transport experiences into prospective knowledge and repertoires of responses that flight nurses can act on in the face of future transport challenges. The interpersonal storytelling interactions between flight nurses constitute an important mechanism for learning vicariously from others' experiences. As the dotted arrows indicate, this process is iterative and not always linear. For instance, a story might be told which then triggers a related story to be told, and both are discussed and transformed into lessons for future action. However, an important characteristic of my findings (depicted in Figure 1) is that the storytelling process allows flight nurses to harness the lessons of other crews' experiences in part because this process is embedded in program-level structures and practices that allow these storytelling interactions to serve as a vehicle for vicarious learning, as described further below.

Enabling and Scaling Vicarious Learning from Storytelling

Alongside this multistage process of storytelling for vicarious learning, my data revealed a combination of collective practices and program-level structures in place at AirMedPro that worked to both *enable* flight nurses' vicarious learning through storytelling and *scale* the lessons emerging from it, as the examples in Table 2 highlight.

Enabling. Various structures and practices at AirMedPro supported the process of learning vicariously from stories, allowing flight nurses to better learn from one another's experiences in storytelling interactions. These efforts, though not always intended for this supportive purpose, enabled flight nurses to derive greater learning value from stories of others' experiences by ensuring that they came to the storytelling interactions with the requisite experience and knowledge to understand and draw lessons from others' flights. One such structure was the mandatory learning requirements and training sessions that flight nurses completed (typically each quarter). The goal of these learning modules was to compensate for areas in which flight nurses may not get adequate exposure through their day-to-day work. For each major care domain, flight nurses were required to log a certain number of hours of learning:

> We have a different module quarterly, and we just finished our OB [obstetric] and neonate [modules]. 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.

Though these training hours reflect an independent approach to learning and can serve a valuable purpose in and of themselves, they also play a key role in

Figure 1. Conceptual Model of Storytelling for Vicarious Learning at AirMedPro

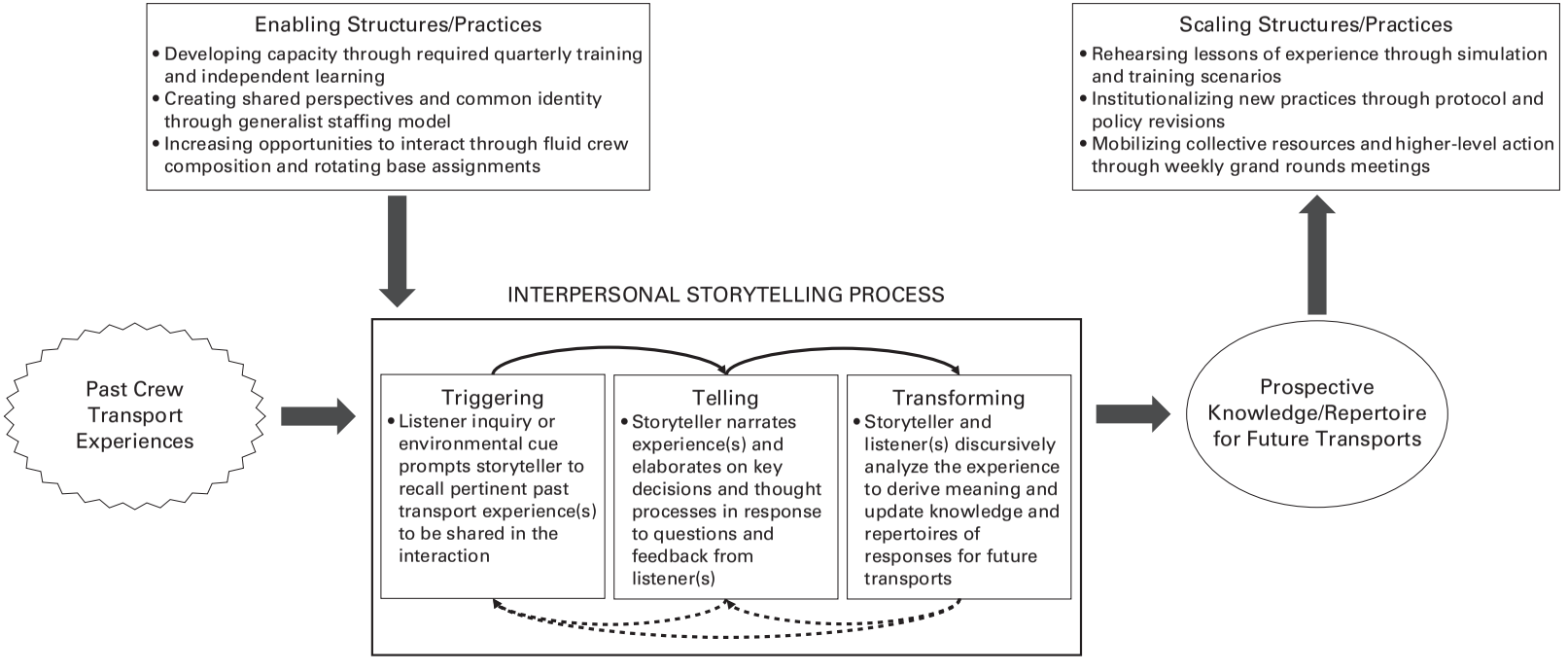

Table 2. Additional Illustrations of Enabling and Scaling Storytelling

Dimension / Theme	Representative Illustration
Enabling Storytelling	"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 . . . unless you've seen a movie, you're not going to be able to conceptualize that."
	"One of the things it's really helpful is hearing the experiences of my colleagues. . . . 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 say], '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. Not that a lot of mistakes are made—I don't like to use that word 'mistakes'—but when things don't go right, that's a huge learning tool . . . to know what they went through and know [that] they did everything right, and still things didn't go the way you expect them to. . . . I don't have a negative feeling . . . like a lot of people say, 'Oh better you than me,' [but] I don't feel that way. I always feel like, 'You did the best you could. That was awful that that was the situation you were in.' I have a very strong feeling about the flight nurses here: everybody wants to do the best job possible. There's no doubt in my mind that they're here because they want to do a good job. They want the challenge of taking care of the most critically ill and the most seriously injured, and they want to do it right."
Scaling Storytelling	**Flight nurse:** "At the change of shift, you'll get [stories], because we always ask, 'Did you guys fly today?' 'What did you guys do?' And that's when 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." **Interviewer:** "So, it's kind of more detailed when you hear it at rounds?" **Flight nurse:** "Yeah."
	"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 [patient who had] overdosed on heroin and bath salts and a whole bunch of other crap. We got there, and the [patient] was in full-blown ARDS, he had a heart rate of 270; he was just really crazy. . . . So we straightened him around on the ventilator side, and we sedated the hell out of him and got his heart rate down somewhat. . . . But as a result of that, because I had the toxicology protocol, I requested that [the education coordinator] put an algorithm in there to review tachycardia with cocaine and all these crazy drugs that kids are taking these days [to give guidance on] how to address that particular piece of it. . . . So if it ever comes up again, it's like, 'Oh, yeah, we've got that arm down here in the protocol. If this [scenario] happens, you might consider these things.'"

enabling vicarious learning from others' stories. As the flight nurse who serves as the program's education coordinator said during a grand rounds 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 discuss it during rounds, that you are able to get something out of that.

Thus flight nurses use these independent, formal learning opportunities as tools to build the baseline understanding and capacity necessary to learn vicariously through storytelling interactions. Using traditional training and education to create a foundation of knowledge that can then be expanded by learning

from others' experience allows flight nurses to make the most out of each form of learning. In other words, flight nurses complement their general understanding (from traditional learning methods) with a more contextualized, nuanced understanding (from storytelling), as a newer flight nurse 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 [some] 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.

A second practice that enables storytelling for vicarious learning at AirMedPro lies in its staffing model: the use of generalists working in fluid, rotating crews across both of the program's bases. Many air medical transport programs staff flights with individuals in specialized roles, i.e., as either a flight nurse or flight paramedic, and working on only pediatric or adult transports. In contrast, AirMedPro flight nurses are also dual-licensed as paramedics, and they fly patients of any age, which requires that they have years of experience in both adult and pediatric care (and in both emergency departments and intensive care units). Flight nurses at AirMedPro are thus better able to develop shared practices and understanding, as this flight nurse noted when comparing work at AirMedPro to her experience at another air medical transport 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. . . . For example, flying for them, the paramedic and what his normal values are looking at that monitor [are] 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. . . . [But here] I can fly with any given person and we know the steps that what we're going to do. We know the process.

This generalist staffing helps to create more consistent care standards, but at the same time, sharing similar educational backgrounds and expectations for learning also enables flight nurses to ''speak the same language'' when performing and discussing their work. This approach creates a common core of knowledge and language that facilitates flight nurses' ability to share stories and learn from one another. It also creates a sense of shared identity, camaraderie, and positive regard among flight nurses—a sense that they are all in the same position and striving to do their best, as a quote in Table 2 shows. This enables them to engage more productively in storytelling interactions, supporting the norms of sharing stories and responding constructively and respectfully to others' stories.

The generalist staffing model also fundamentally supports vicarious learning by creating structured opportunities for more flight nurses to interact and engage in storytelling. Any two flight nurses at AirMedPro might interact with one another either at shift change or as crew partners—a feature that is more constrained in air medical programs with a nurse–paramedic staffing model or operating with fixed partners or base assignments. AirMedPro has flight nurses who primarily work either day or night shifts, but others work ''rotator'' shifts, and even the consistent day- or night-shift flight nurses occasionally work a

different shift time. Additionally, even consistent day- or night-shift flight nurses work with different partners over time. This scheduling system allows experiences to be shared more broadly, as flight nurses interact with many colleagues:

> That's another interesting thing because we don't have regular [fixed] partners. Today I'm working with [one flight nurse]. 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.

This rotation and fluidity in crew staffing (alongside other practices and structures, such as the mandatory learning requirements described earlier) thus increase flight nurses' collective ability to engage in, and draw lessons from, their interpersonal storytelling interactions, enabling knowledge and experience to move across crews.

Scaling. My analysis also revealed various efforts to help scale the lessons learned from a storytelling interaction to all members of AirMedPro. These scaling structures and practices help extend and incorporate the lessons from stories of past crew experiences into collective action going forward, allowing storytelling to function as a strategy for improving future patient care efforts throughout the entire program rather than only among the flight nurses involved in a particular storytelling interaction.

A primary structure AirMedPro uses for this scaling is its weekly grand rounds meetings, in which cases are reviewed in a group setting, led by the medical director and educational coordinator. During these meetings, the crew who transported a particular patient presents their case to the group and discusses what they learned from their actions and outcomes. These meetings provide a key ''story place'' where narratives of past experience are shared and analyzed for others' learning. Yet, flight nurses described these meetings as somewhat different than other places of storytelling interactions (i.e., during down time or shift change) because prior to presenting at rounds, flight nurses generally have already engaged in informal, interpersonal storytelling with others (as a quote in Table 2 highlights). One flight nurse told me, ''Rounds are really good as a consolidation of everybody's comments.'' In contrast to informal storytelling interactions that address the full range of tacit and explicit elements of an experience, presentations in grand rounds tend to focus more on breaking down particular aspects of the case, with the goal of building consensus with other flight nurses and getting input from the medical director on appropriate action. Because of the somewhat public nature of the meeting, stories of cases told at grand rounds tend to be more focused and emphasize only one or two issues that the nurses who flew the case (or the educational coordinator) think would be useful to discuss in a collective forum. Summarizing the differences between informal storytelling and the more focused nature of cases presented at rounds, one flight nurse noted:

> There's a storytelling process to giving a report [discussing flights at shift change], and I think that there's a storytelling process to giving rounds, too. It's not the same story process because I think we're more honest in the [shift change] report. I think

> every report-off, it's a very animated storytelling process. . . . 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.'' . . . [But at rounds], I think it's cleaner in front of the medical director . . . it's a cleaner story.

The grand rounds meetings seem to provide an opportunity to collectively address a learning point from a particular case and institutionalize a shared understanding of how to respond, such as by generating a program-wide shared practice for better responding to an issue or mistake that occurred on a particular case. This consensus building, guided by input from the medical director, is then incorporated 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. As one flight nurse noted:

> The process is designed [such] 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 . . . [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.''

By providing a regular convening place for the whole program to discuss cases, grand rounds meetings help to surface issues that need to be addressed at a higher level. Though flight nurses can learn from each other through informal storytelling interactions, the lessons of these experiences sometimes suggest changes to be made at the program level or even more broadly in the hospital. Grand rounds meetings are an opportunity to raise these issues to the leaders who can implement changes. For instance, a flight nurse described a case in which the crew was promised an additional resource from another department—a team of specialists who would come to the small hospital where the crew was treating a patient and bring additional equipment to accomplish the transport. But after being told the specialist team was coming, the crew was later told the team wasn't available. By discussing the case in grand rounds, the crew made the medical director aware so he could take up the issue with the other department:

> 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 [specialist] 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.

Another practice that the program employs to scale the learning emerging from storytelling is the use of realistic training scenarios with human patient simulators—advanced, computer-controlled mannequins that can simulate a range of illnesses and injuries. The scenarios are used in a variety of ways at

AirMedPro: when interviewing and onboarding new staff, for the continuing education of flight nurses, and even as a public service tool when flight nurses go to a local EMS station, for instance, to conduct training. Scenarios are often created from prior cases that crews have flown, using the simulation tools to develop a rich, detailed re-creation of the experience in order to facilitate others' learning. As one flight nurse involved in the simulation process described:

> 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 into a scenario, and you see how two other flight nurses would have responded to that same scenario. Would they have done the same thing as their two other fellow coworkers? [It] is very interesting because some people might have done something different. Others may have done better, done worse, done the same.

Scenarios reinforce collective abilities by allowing flight nurses to compare and contrast their different intended responses to a similar scenario and generate a shared perception of better (or worse) approaches. In this way, the simulation scenarios help to elaborate a particular experience one crew faced into a standard, routine response that all flight nurses could implement:

> There were a couple things that I learned doing the simulator training that I had no clue [about]. . . . 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 the ER last week.'' . . . and now he presents it in a scenario, and it's like, ''Wow, that is really great because I will never forget that.''

Scenarios are particularly useful for promoting learning because the simulation process allows for re-creating the multifaceted experience that emerged from the story of a case—focusing on not only the clinical challenges but also the associated experiences (e.g., 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 helps develop flight nurses' abilities, as they all get practice responding to the challenging conditions that a crew 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.'' . . . 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. . . . 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.

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. This repeatability allows them to rehearse and routinize responses, reinforcing the lessons learned from the story and scaling them to the level of the entire program. Combined with other structures and practices (such as grand rounds), these efforts help broadly disseminate the lessons and collective changes arising from any given transport story, resulting in enhanced knowledge and response repertoires among a greater number of flight nurses.

DISCUSSION

Through an inductive exploration of flight nurses' learning from others' experiences in an air medical transport program, I developed a conceptual model of storytelling as a valuable tool for vicarious learning, particularly in organizational settings in which work is hard to observe and somewhat ambiguous. This vicarious learning involves a multistage process of triggering, telling, and transforming stories—converting raw experience into prospective knowledge and expanded repertoires of possible responses to future events—embedded in a broader context that both enables and scales the learning from these storytelling interactions.

Contributions of a Storytelling Approach to Vicarious Learning

My findings challenge and advance studies of learning from narratives in organizations by refocusing attention on elements of the story performance (i.e., Boje, 1991), such as the location of storytelling interactions (e.g., ''storytime'' and ''storyplace''; Connell, Kleįn, and Meyer, 2004) and the triggers of these interactions (both structured and ambient). Advancing extant work showing *that* storytelling occurs and *what* stories promote learning, these findings help us better understand *how* interpersonal storytelling interactions translate prior experience into prospective knowledge and insights for responding to future challenges. The model developed here articulates specific actions that constitute learning through storytelling, extending prior rich descriptions of storytelling interactions in organizations (e.g., Boje, 1991; Orr, 1996) to offer a more nuanced, robust understanding of this learning process.

Storytelling for vicarious learning between crews at AirMedPro is an emergently organized process—influenced both by informally shared norms and expectations for storytelling and by formal structures and practices—offering an extension of prior work that views learning from others as an unintentional, inadvertent byproduct of interaction. For instance, in introducing communities-of-practice, Brown and Duguid (1991) specifically drew from Orr's research (later published in Orr, 1996) on Xerox repairmen and their interactive storytelling practices in articulating the value of interpersonal interactions and participation with more expert community members for novices' learning and performance. But the subsequent literature on communities-of-practice (and related work on situated learning) has adopted the simplistic assumption that this learning from other community members is a largely subtle, unintentional byproduct of individuals' increasing participation in the community (as noted by Bailey and Barley, 2010). Building on this foundation, learning through storytelling has often been characterized in subsequent research as inadvertent, haphazard, and divorced from more formal learning processes at work—i.e., as

taking place through ''water cooler'' conversations that are presented as a foil to highly formalized organizational training.

The model emerging from this study contributes a novel understanding of how storytelling can be used for vicarious learning alongside, and in harmony with, other formal and informal learning strategies at work. AirMedPro flight nurses employ many learning strategies (e.g., hands-on skills trainings, textbook review, discussions with physician experts), which impact and are impacted by their engagement in storytelling to learn from other crews' experiences. In contrast with earlier perspectives that informal, story-based learning often contradicts the lessons of formal training (e.g., van Maanen, 1973), my model highlights that other learning efforts can enable greater engagement in storytelling interactions (by providing common language, frames of reference, and a baseline understanding of key concepts) and provide means to scale the lessons that emerge from stories (e.g., by allowing stories to inform training simulations or one's review of clinical texts). But while these efforts are complementary, they are also distinct: flight nurses routinely distinguished their engagement in storytelling with peers from other learning efforts, such as seeking out expert advice from physicians. The interplay of these different learning practices shows that storytelling can complement and refine learning via other, more traditional means (and vice versa), helping demonstrate the unique benefits of discursive, story-based vicarious learning.

Developing prospective knowledge through storytelling. Another contribution to research on vicarious learning in organizations is this study's emphasis on the transformation of ''raw'' experience, through interpersonal storytelling, into novel insights and prospective knowledge for future use. The process of vicarious learning through storytelling emerging from this study involves sharing tacit elements of a prior experience, in addition to the sharing of concrete information (which has been the focus of most prior vicarious learning research). Engaging in vicarious learning through storytelling interactions thus allows individuals to not only become aware of others' successful techniques or tactics but also wrestle with and make sense of more ambiguous elements of the experience to better understand others' thought processes, decision making, and management of complex and at times conflicting demands. Weick (1995) captured these different forms of learning by distinguishing actions directed toward resolving equivocality from those directed toward resolving uncertainty. Uncertainty stems from a lack of information and requires individuals to look for additional facts and ways to interpret them. Equivocality refers to a state of confusion (rather than ignorance), wherein individuals face multiple, often conflicting, meanings or interpretations of an event. Though individuals can resolve uncertainty by seeking additional information, Weick noted that resolving equivocality requires more in-depth interaction that creates a frame of reference for processing ambiguous signals in the environment. Citing a passage from Huber and Daft (1987: 151), he described this interaction as occurring when individuals ''organize cues and messages to create meaning through their discussion and joint interpretation'' (Weick, 1995: 99). By providing a vehicle for discussing and making sense of the full range of prior experience, rather than simply transmitting intact routines or information from past performance, vicarious learning through storytelling

results in a broader set of insights and ideas for responding to future challenges.

At the same time, this reconceptualization highlights the use of vicarious learning as a *prospective* knowledge-generation mechanism, in contrast to the dominant view of vicarious learning as a backward-looking, problem-driven tool in organizations. Alongside the information-focused approach highlighted above, many extant perspectives on vicarious learning adopt a problemistic approach, assuming that individuals seek others' knowledge to resolve a particular problem at hand. Some work has noted that individuals may seek advice and best practices from other teams or units early in the process of task execution, in expectation of future problems (what Bresman, 2013 has termed ''anticipatory search''). However, the prevailing assumption is that this learning is driven by—and framed through the lens of—a particular task to be faced, motivating a search for others' routines or best practices from experience with similar problems. In contrast, the flight nurses I studied engaged in vicarious learning from other crews' experiences as a way of preparing for unknown challenges they might face on future transports. This change in perspective complicates extant theories of vicarious learning in ways that open new avenues of inquiry, such as a consideration of what triggers particular experiences to be sought or shared in pursuit of vicarious learning. Rather than assuming this learning is triggered only problemistically, the conceptual model presented here suggests the presence of a range of other potential triggers of vicarious learning, including another's telling of a related story, tangible documents and case summaries (e.g., the charts documenting prior transports), or even seemingly unrelated ambient cues (e.g., a TV news report). Brookfield (1987: 26) defined a trigger event as any cue that creates 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 vicarious learning interactions.

This prospective conceptualization of vicarious learning invites a reconsideration of the role of context (and contextual cues, such as triggers) for better understanding how learning unfolds at work—moving beyond the assumption that learning interactions unfold only during task performance. Theories of situated learning and communities-of-practice address the issue of context (Brown and Duguid, 1991; Lave and Wenger, 1991) by arguing that learning from others occurs while the individual is engaged in the work or tasks of the community. Similarly, existing studies that acknowledge the learning value of storytelling view stories as told predominantly during work performance (e.g., Orr, 1996), used to narrate and make sense of the task facing employees in a particular context or moment. But this emphasis on the context of *doing* as the site of storytelling and learning is somewhat restrictive and has proved intractable in modern work environments where the opportunity to work alongside and interact with others during the actual performance of the work is limited (e.g., Beane, 2019). My findings offer a more nuanced view of context in this learning process, demonstrating how context can play an active role in triggering storytelling interactions by surfacing latent knowledge and experiences (e.g., cueing a memory of a past transport), as well as motivating the telling of stories by serving as a shared signal of normatively appropriate times and places for storytelling and vicarious learning.

Embedded within this more experience-based, prospective, and contextualized perspective is also a view of vicarious learning as an interactive, discursive process. Storytelling is not simply narration of one person's actions and experience that can then be imitated by others; rather, it involves the exchange of ideas and experiences by multiple parties. This contrasts with perspectives on knowledge sharing in organizations that emphasize the one-way transmission of knowledge from more- to less-experienced individuals (Matzler and Mueller, 2011). My model builds on extant research recognizing the value of two-way discourse for vicarious learning (Bresman, 2013), elaborating and extending recent theorizing of this more coactive form of vicarious learning (Myers, 2018). Exploring how flight nurses engage in discursive storytelling interactions revealed that they are able to crystallize their learning—i.e., internalizing a complex learning experience and articulating a tractable plan for future action (see Nonaka, 1994)—by incorporating techniques from other crews' experience directly into their own response repertoire, as well as by allowing others' experience to ''audit'' their existing knowledge and guide future learning efforts. Even highly experienced individuals can learn from these interactions by testing their existing understanding and updating their knowledge by recounting and reinterpreting their prior experiences for others. Moreover, this discursive sharing of experiences enables more collective learning (i.e., a change in collective response sets; Sitkin, Sutcliffe, and Weick, 1998), as these storytelling interactions move learned content into a shared domain outside of a single individual. This allows the learning to outlive any one person and contribute to collective adaptation and structural change, providing a mechanism for explaining collective responses to future environmental changes (Weick and Ashford, 2001; Bailey and Barley, 2010).

Situating storytelling within broader structures and practices. Recognizing the collective value of learning through storytelling highlights a final contribution of this work to the literatures on storytelling and vicarious learning in organizations: it adopts a cross-level perspective, revealing how interpersonal storytelling interactions and the broader structures and collective practices in which these interactions are situated can coalesce in the enactment of vicarious learning. Much of the literature on vicarious learning is focused at the organizational level of analysis, either exploring formal organizational practices that promote knowledge sharing among units within a firm or examining how organizations use other firms' experience to enhance their own learning and performance (e.g., Huber, 1991; Haunschild and Miner, 1997; Hansen, Nohria, and Tierney, 1999; Madsen and Desai, 2010; Argote, 2015). Meanwhile, research on storytelling is generally focused at the individual, dyadic, or small-group level of analysis, given the inherently interpersonal nature of storytelling. The conceptual model developed here illuminates the role of collective structures and practices that both enable engagement in this vicarious learning and scale the lessons emerging from storytelling interactions, reflecting a confluence of formal and informal elements of organizations (McEvily, Soda, and Tortoriello, 2014). In contrast to prior work focusing solely on organization-level explanations for the spread of knowledge or best practices across teams or units, this model articulates how interpersonal storytelling may serve as an explanatory mechanism—enabled by and scaled to efforts at the collective level—for how the experiences of one crew influence the

knowledge and actions of future crews at AirMedPro (i.e., addressing potential situational, action-formation, and transformational mechanisms underlying learning at the collective level; Hedström and Ylikoski, 2010).

By articulating a model of how these practices and structures enable and scale the learning that occurs in interpersonal storytelling interactions, I offer a cross-level perspective that can provide a more robust understanding of when, how, and why storytelling can be a tool for vicarious learning in modern, knowledge-intensive organizations. For example, the enabling structures and practices at AirMedPro not only increase the opportunity for interactions among different flight nurses (i.e., by using a single pool of generalist flight nurses deployed in fluid teams) but also increase the collective learning capacity of flight nurses (i.e., absorptive capacity; Cohen and Levinthal, 1990) by establishing a shared language and baseline level of knowledge that facilitates the assimilation of new experiences into their existing knowledge. Requiring ongoing independent learning and hiring individuals with greater intrapersonal expertise variety (Bunderson and Sutcliffe, 2002; Huckman and Staats, 2011) serve to prepare individuals for vicarious learning by providing the rich and diverse pool of existing knowledge necessary to build their absorptive capacity and draw meaning from others' stories. As March (2010: 47–48) observed, there is a tension inherent to storytelling, in that ''the more accurately reality is reflected, the less comprehensible the story, and the more comprehensible the story, the less realistic it is.'' Navigating this tension is driven in part by the audience's intelligence and ability to tolerate complexity, generating the ''maximum comprehensible complexity'' of a given story (March, 2010: 43). The diverse, extensive experiences required (by hiring practices) and elaborated (by ongoing training) at AirMedPro help increase this capacity for comprehending complexity, enabling flight nurses to tell and listen to more detailed and nuanced (and therefore realistic) stories of past transport experiences. At the same time, these practices also help create a sense of commonality and shared social identity among flight nurses, which has been shown to facilitate knowledge transfer between members of different teams by enhancing individuals' consideration of others' knowledge (Kane, 2010). Establishing these common frameworks for interacting also enables individuals to demonstrate mutual respect in their interactions, which can increase interpersonal trust and psychological safety, benefitting learning (e.g., Edmondson, 1999).

The conceptual model developed here also attends to efforts that follow storytelling interactions, identifying the key role of shared practices in scaling these interactions into enhanced collective response repertoires. By creating venues (e.g., grand rounds meetings) for developing collective consensus and implementing policy change, as well as tools (such as human-patient simulator scenarios) for rehearsing responses to others' prior experiences, the structures and practices at AirMedPro help build collective routines for future action and thus facilitate greater learning (Wilson, Goodman, and 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 reused by different organizational members (Feldman and Pentland, 2003). Additionally, these efforts help flight nurses develop a shared sense of collective efficacy—a future-oriented judgment about the group's capability to execute a course of action to attain a goal (Bandura, 2000)—by making everyone aware of the cases that were transported and by developing

rehearsed responses for addressing those cases in the future, which can influence how effectively individuals make use of prior learning in the face of a future challenge (Goddard, Hoy, and Hoy, 2004).

Finally, though the fluid teams at AirMedPro were engaged in similar work and were drawing on common functional expertise, the enabling and scaling structures and practices used in this setting may also be relevant to understanding how teams can engage in learning and coordinated problem solving across greater degrees of functional difference, such as in multiteam systems in organizations (Luciano, DeChurch, and Mathieu, 2018). Research on multiteam systems has highlighted the need to better understand how distinct, disparate component teams within a broader system can develop the trust, cohesion, confidence, and shared mental models necessary to engage in effective coordination and performance (e.g., Luciano, Nahrgang, and Shropshire, 2020), emergent states that can be positively influenced by the sorts of enabling structures and practices described here (e.g., implementing more generalist hiring, cross-training, or rotational practices across component teams). Likewise, attending to the use of systemic structures and practices that scale the lessons learned from differentiated learning efforts within and among component groups/teams (such as collective gatherings or the use of simulated exercises) can help build greater transactive memory and shared mental models that can help navigate the tensions of dynamism and differentiation inherent to multiteam systems (see Luciano, DeChurch, and Mathieu, 2018).

Boundary Conditions, Implications, and Future Directions

I turn now to several important boundary conditions of this work and their implications for future research. As the model here was developed on the basis of rich, detailed qualitative data generated from a single organizational setting, it is important to consider the features of this setting that may influence the findings in particular ways. Flight nurses at AirMedPro work in very small (two-person), fluid teams of generalists—all having the same occupational scope, task responsibilities, and background. Though these findings contribute to the bourgeoning literature on fluid team structures and processes, the findings would be extended and enhanced by considering these learning processes in settings in which teams are larger, their membership is fixed, or fluid team structures are deployed across occupational or industry boundaries (e.g., Kerrissey, Mayo, and Edmondson, 2021). For example, looking at storytelling practices in teams that contain members from multiple occupations or functional backgrounds (building on work that has explored the role of narratives as boundary objects in cross-functional coordination and innovation; Bartel and Garud, 2009) may reveal different strategies for building absorptive capacity for learning from the complexities of others' stories. Indeed, prior work has shown that a more generalist orientation or experience base enables greater knowledge transfer among personnel rotating to a new group (Fahrenkopf, Guo, and Argote, 2020) and enhanced learning from others at the organizational level (Haunschild and Sullivan, 2002). Though I incorporate this generalist orientation as a collective-level structure enabling storytelling interactions, this commonality in background and task objectives among AirMedPro flight nurses may have been influencing other learning- and performance-relevant dynamics in this setting, such that these vicarious learning

processes would unfold differently in settings in which stories are being told across different specialized occupations or roles.

These differences in team structure and composition reflect merely one way in which the unique setting of air medical transportation could differ from other work environments. An additional distinguishing characteristic of this setting is the degree to which flight nurses experience down time between transports. Having this time during which they are not engaged in their primary task of transporting patients may facilitate flight nurses' engagement in storytelling and learning, and it is somewhat distinct from many other workplaces (though certainly not unique in the landscape of on-demand service organizations). Though features like these make this setting an ''extreme'' work context, this extremity also throws the process of storytelling for vicarious learning into sharper relief, allowing for the development of richer, more nuanced theoretical insights than would have been allowed in a milder context (Eisenhardt, 1989; Bamberger and Pratt, 2010). Learning has been specifically identified as a topic that can benefit from study in risky or emergency contexts, providing an environment for generating a robust understanding of ''hard-to-get-at'' phenomena (Hällgren, Rouleau, and de Rond, 2018) that can be relevant to a broad range of organizational settings. The high ambiguity and low observability that define the work of air medical transport flight nurses also increasingly characterize work environments in a variety of other settings, suggesting that this story-based approach to vicarious learning may carry important implications for a range of organizations. Organizations in such work environments might consider, for example, making changes to meeting structures and project debriefs that better allow them to scale informal learning that occurs during a project, implementing structures that help build individuals' absorptive capacity for learning from others, or creating designated spaces and times for promoting interpersonal learning.

However, there are certainly elements of flight nurses' work that are not typical in other environments. Notably, the consequences and emotional weight of stories (particularly stories of failure) are likely more severe in this setting than in other organizations, which may influence certain factors of the model developed here. For instance, perhaps the stark consequences for failure in this setting play a role in triggering particular stories to be told and attended to for learning in ways that would be less likely in other environments. More repetition (either repeated tellings by the same storyteller or retellings by others in the organization, as described by Dailey and Browning, 2014) may be required in other settings before the lesson of the story sinks in. The consequences of the work that flight nurses perform is an inescapable feature of this context, yet there was still quite a bit of variation in the extremity of stories told by AirMedPro flight nurses. Relatively benign or straightforward transport stories were still triggered and recounted (e.g., due to structural triggers, such as shift change), making it less likely that the entire conceptual model rests on this severity of outcome. Nonetheless, this feature of the context invites further study of the characteristics of work stories that might attenuate or amplify this vicarious learning process. Some research has explored the relative learning benefit of failure, success, and exceptional success stories (e.g., Joung, Hesketh, and Neal, 2006; Bledow et al., 2017; Quinn et al., 2021), but what makes an experience particularly memorable or effective for story-based learning is still a relatively open question. Future research might thus explore what features of an experience make for a memorable, valuable story from which to learn—and how these features may vary across organizational settings.

When it comes to caring for patients suffering from extreme injuries or illnesses that require rapid transportation, trial and error is typically the least preferred method of learning. The insights from this study contribute to a more nuanced understanding of a felicitous alternative—vicarious learning—and how it is enacted through interpersonal storytelling in modern knowledge-intensive work. In environments in which work is ambiguous and opportunities to directly observe others are scarce, storytelling can help the lessons of others' experiences impact individual and collective learning and guide future performance.

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