Learning from preventable adverse events in health care organizations: Development of a multilevel model of learning and propositions

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Background: Preventable adverse events represent learning opportunities. Indeed, understanding and learning from preventable adverse events are the new organizational imperatives in health care. However, health services researchers note that there is a dearth of research on learning from failure in health care and, in industry, a limited capacity to learn from incidents and failure.
Purpose: We address the gap between awareness of preventable adverse events and knowledge that relates to how to respond to them effectively. We develop a multilevel model of learning and theorize factors that influence learning from preventable adverse events.
Methodology: Drawing upon theories of organizational learning and organizational behavior, we develop a multilevel model of learning from failure, where perceived characteristics of the events, group composition and dynamics, and the behavioral and structural arrangements of health care organizations are proposed to play important roles.
Practical Implications: Our model highlights factors that facilitate learning from failure and others that impede it. Awareness and attention to these factors can help health care managers extract learning from failures, like preventable adverse events, and may ultimately contribute to reducing the occurrence of preventable adverse events and improving quality of care.

Key words: organizational learning, preventable adverse events

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In health care, an adverse event is an unintended injury or complication that results in disability, death, or prolonged hospital stay and is caused by factors other than the patient's underlying disease (Wilson et al., 1995). Adverse events are not generally caused by one terrible mistake, but by the cumulative effect of small errors—medical, nursing, organizational, and administrative (Rosenthal & Sutcliffe, 2002). More broadly, adverse events can result from human errors and latent failures—failures arising from organizational and administrative processes and systems (Reason, 1997)—and they tend to emerge from interactions between multiple, interconnected components within these complex systems (Kohn, Corrigan, Donaldson, & Institute of Medicine [IOM], 1999). Adverse events may or may not be preventable. Nonpreventable adverse events reflect risks associated with treatment, such as a life-threatening allergic reaction to a drug when the patient had no known allergies (Kohn et al., 1999), whereas preventable adverse events (e.g., allergic reactions to drugs where known allergies were listed on the chart) are avoidable events that offer substantial opportunities to learn from performance failures and thus develop responses to mitigate or prevent them in the future.

The State of Knowledge on Learning From Failure

Adverse events have increasingly received attention from practitioners, health care policy makers, and academics since the publication of the IOM report in 1999 (Stelfox, Palmisani, Scurlock, Orav, & Bates, 2006). Recent international studies estimate the incidence of adverse events to be between 3% and 17% of all acute care hospital admissions (e.g., Baker et al., 2004; Wilson et al., 1995), and *roughly* 50% of those have been judged to be preventable. Although estimates of preventability have ranged widely (37%–75%) and the process for arriving at these estimates has been called into question (e.g., Hayward & Hofer, 2001), it is clear that preventable adverse events are nontrivial in number and that they will always occur in health care. Accordingly, efforts to better understand these events and to learn from them are imperative from an institutional perspective (Kohn et al., 1999) and from the perspective of patients receiving care (Gallagher, Waterman, Ebers, Fraser, & Levinson, 2003). An important patient safety policy document published in the UK, *An Organisation With a Memory* (Department of Health, 2000), concluded that there is insufficient research on learning from failure in health care and limited capacity to learn from incidents and failures in the UK's National Health Service. Similar findings have been noted in the Unites States (Tucker & Edmondson, 2003). Clearly, there is a gap between awareness of preventable adverse events and knowledge that relates to how to respond to them effectively.

To date, the literature on medical error has tended to focus on descriptive reports of incidence rates and prescriptive error prevention models. These statistics are important, but they offer few insights into mechanisms for reducing preventable adverse events and they lack theoretical foundations for understanding ways to prevent such events (Hoff, Jameson, Hannan, & Flink, 2004). Given the pervasive barriers that exist when it comes to learning from failure (Edmondson, 2004) and the slow pace of change when it comes to improving patient safety more generally (Longo, Hewett, Ge, & Schubert, 2005), research that moves beyond descriptive reports of safety problems to actionable models of error prevention and practice change is warranted.

Objectives

The goal of this article is to develop a theoretical model of learning from failures, represented by preventable adverse events in health care organizations, using the lens of organizational learning and organizational behavior. We theorize that improving quality and patient safety in health care organizations requires consideration of the capacities of individuals, groups, and the organization to translate and transfer knowledge and experience acquired from preventable adverse events and to act upon this to prevent the occurrence of similar events. Because learning occurs at different levels, including among individuals, groups, and organizations (Crossan, Lane, & White, 1999), we draw upon learning theories (e.g., Argote, 1999; Crossan et al., 1999; Levitt & March, 1988) as well as group behavior literature (e.g., Williams & O'Reilly, 1998) to theorize a multilevel learning model. In addition, we present several actionable practices to enhance unit and organizational learning capacity and to improve responsiveness to preventable adverse events.

Model Development

Defining Learning

Past research on organizational learning has offered various definitions of learning, depending on the context (Argote, 1999; Crossan et al., 1999). These diverse definitions of organizational learning all share a common thread—learning is composed of the processes by which knowledge is created, retained, or transferred (Argote, 1999) and is evidenced by performance improvements. Accordingly, we define learning from preventable adverse events in health care organizations as the processes of creating, retaining, and transferring

effective knowledge and practices to reduce the likelihood of similar events reoccurring in the future. In this context, learning from failure manifests in the tacit approaches and explicit actions of individuals, groups, and organizations related to the reporting of preventable adverse events, the analysis of their causes, and implementation of changes designed to prevent similar failures in the future (Sasou & Reason, 1999). Changes can range from adjusting operating procedures (explicit action) to focusing on system/latent factors rather than immediate causes such as individuals' mistakes when events are investigated (tacit approach). Using incident reporting systems to monitor and track incidents (e.g., Runciman & Moller, 2001), implementing root cause analysis (e.g., Wald & Shojania, 2001), and sharing patient safety performance knowledge across health organizations (Rivard, Rosen, & Carroll, 2006) provide other practical examples of explicit actions on the part of groups or organizations in response to learning from preventable adverse events.

Preventable Adverse Events as a Source of Learning

One fundamental mechanism in learning theory is the adjustments that individuals, groups, and organizations make to their behavior based on outcomes of their previous experience (Cyert & March, 1992). Recent studies on learning from failure at the organizational level have shown that nursing home chains responded to failure practices by abandoning them (Chuang & Baum, 2003), and airline carriers learned by analyzing the causes of aviation accidents, which in turn reduced future accident rates (Haunschild & Sullivan, 2002). The implication of these studies is that unsatisfactory outcomes call existing practices into question and prompt organizations to change their practices. Accordingly, these unsatisfactory outcomes have been viewed as important drivers for learning (e.g., Miner, Kim, Holzinger, & Haunschild, 1999). Similarly, we argue that preventable adverse events represent an equivalent source of failure in health care—one affording the same kind of learning opportunities. Patient safety failures such as preventable adverse events can upset the status quo, draw attention to roots of problems, stimulate problem search, formulate responses, and modify procedures. When this set of processes occurs, health care organizations develop knowledge and capabilities to reduce occurrence of similar events, ultimately improving patient safety.

Organizational Learning is a Multilevel Process

Organizational learning is a dynamic process where learning occurs over time and potentially diffuses across levels. While individual learning contributes to group and organizational learning, institutionalized norms, procedures, and routines at the group and organizational levels also influence individuals' attention, thinking, and actions (Crossan et al., 1999). Individuals within an organization draw inferences from their experience by analyzing and interpreting the relationships between past practices and the outcomes of these practices and modify the practices if necessary. When an individual's learning processes are shared with other members of a workgroup, individual learning is recombined with the learning, experience, and interpretation of other group members to shape learning at the group level. Through this process, group members may develop mutual understandings of one another's experiences and perspectives, which in turn modify the practices that are collectively perceived to be effective or ineffective. Practices that are deemed to be effective are likely to be retained in the group and transferred to other groups within an organization (Argote, 1999). When these modified practices diffuse throughout the whole organization, they become institutionalized (Crossan et al., 1999). Accordingly, learning across individual, group, and organizational levels tends to exhibit a circular process where knowledge and practices flow from the individual to the group to the organizational level. Then, what has already been learned feeds back from the organization to the group and individual levels, influencing, if not constraining, how individuals act and think (Crossan et al., 1999). Institutionalized practices tend to be favored over new practices and will be used in perpetuity unless they begin to produce unfavorable outcomes (Levitt & March, 1988).

Because learning traverses multiple levels in organizations, it is susceptible to a multitude of factors at these levels that can facilitate or stymie learning transfer. Individuals and groups are the building blocks of organizations; therefore, factors associated with individuals' knowledge and experiences with adverse events, as well as group dynamics, will all contribute to learning from preventable adverse events. In addition, the structural and behavioral arrangements of health care organizations can reinforce or impede learning and the transfer of knowledge and experiences within organizations. Furthermore, the perceived characteristics of the events can attract various degrees of attention from individuals, groups, and organizations, which in turn affects propensities to respond to and learn from these events (Tamuz, Thomas, & Franchois, 2004). Finally, organizations learn not only from their own experience but also from the experiences of other organizations (Levitt & March, 1988). Therefore, depending upon the degree of an organization's connectedness with other organizations, the experiences of other organizations can also contribute to organizational capacity to learn from

preventable adverse events. In sum, learning from preventable adverse events in health care organizations is likely influenced by the characteristics of the preventable adverse events, the experiences and perspectives of individuals experiencing the events, a host of group and organizational-level factors, and learning from interorganizational relationships. Figure 1 summarizes a multilevel learning model which acknowledges the possible influences of factors at these various levels on learning from preventable adverse events. In the sections that follow, we elaborate on the effects of specific factors on the capacity to learn from failures.

Factors that Influence Learning

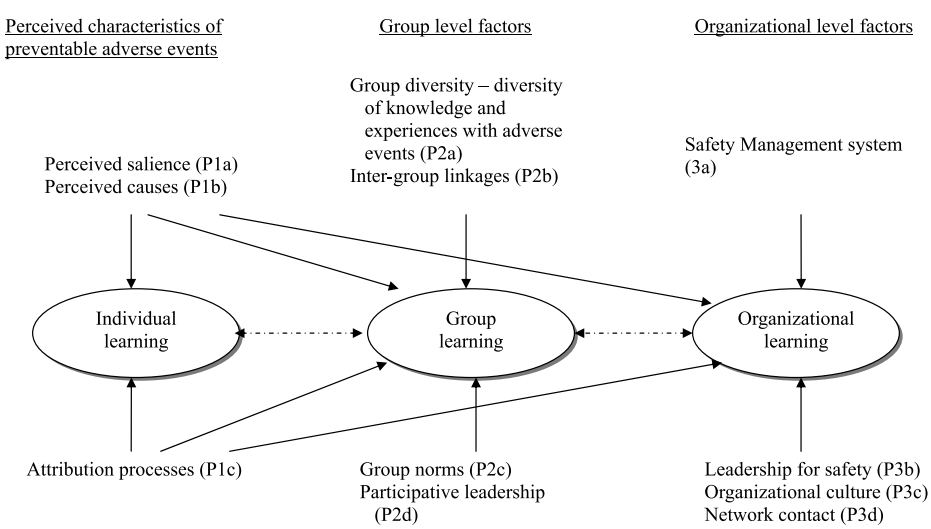
Perceived Characteristics of Preventable Adverse Events

Decision makers have a tendency to attend to some events while ignoring others (Fiske & Taylor, 1991). This selective attention is not objective but is the result of enactment processes where decision makers construct, rearrange, single out, and demolish many of the objective features of their surroundings (Weick, 1979) and of the limited cognitive capacity of individuals, described famously as "bounded rationality" (Cyert & March, 1992). The enactment process and limited cognitive capacity can influence the perceived characteristics of adverse events, which in turn affect the propensity of individuals, groups, or organizations to learn from them.

Perceived salience. Although individuals, groups, and organizations abandon practices for which they receive negative feedback (Bandura & Cervone, 1983; Chuang & Baum, 2003), the likelihood of abandoning practices that receive negative feedback can depend upon the salience of failure. Boundedly rational individuals tend to pay more attention to salient events due to their selective attention (Fiske & Taylor, 1991). Sentinel events in health care (adverse events with severe consequences), for example, both because of their salience and because they often find their way into public discourse through the media, tend to garner greater attention than do adverse events with more minor consequences. Sentinel events can also have a significant negative impact on the legitimacy of health care organizations in the eyes of their stakeholders. Accordingly, salient preventable adverse events may trigger responses of greater magnitude and immediacy because they attract more attention. Individuals, groups, and organizations in turn would be more likely to take action to learn from these events by conducting in-depth analyses to identify the underlying process flaws that may have caused the failure. Indeed, this is exactly what occurred in one Canadian children's hospital when inquiry and learning followed the death of a 4-year-old that was due to a drug dosage calculation error. No such response occurred when the identical dosage

Figure 1

Learning from preventable adverse events in health care organizations. The solid arrow lines indicate the relationships suggested in our propositions.



calculation error made earlier resulted in less harm to another patient in the same organization (Canadian Broadcasting Corporation, 2003). Therefore,

> *Proposition 1a:* Preventable adverse events perceived as being more salient will have positive impacts on individual, group and organizational learning from the events.

Perceived causes of preventable adverse events. The perceived causes of preventable adverse events will have an impact on learning. In their analysis of learning from failure in the airline industry, for example, Haunschild and Sullivan (2002) found that accidents deemed to be causally heterogeneous are better for learning because heterogeneity produces a deeper, broader search for causality, avoiding simple (homogeneous) explanations like "blame the pilot." This finding is consistent with most work on patient safety and human error suggesting that focusing on the multitude of system or latent causes of failures will be more fruitful than blaming individuals when it comes to improving patient safety (e.g., Kohn et al., 1999). Perceived causal heterogeneity of preventable adverse events, including complex interactions of multiple factors, may provoke greater learning because it is likely to lead to more in-depth investigations and more attention to the latent sources of failure, moving away from simple, proximate, or blame explanations (Haunschild & Sullivan, 2002; Reason, 1997). Therefore,

> *Proposition 1b*: Preventable adverse events that are perceived to be caused by heterogeneous factors will have positive impacts on group and organizational learning from the events.

Attribution processes. Proposition 1b is consistent with the central idea in patient safety that a focus on the individual as the cause of error makes it harder for systems to learn (Department of Health, 2000). However, attribution theory suggests that, in some instances, individual-level attributions may serve to enhance learning. Individuals who attribute negative outcomes to themselves may take appropriate steps to improve future performance or to prevent the reoccurrence of a negative outcome, whereas individuals who attribute negative outcomes to others or blame organizational or administrative systems are unlikely to do anything in response to the negative outcome (e.g., Nisbett & Ross, 1980). For instance, Wu, Folkman, McPhee, and Lo (1991) found that house officers who accepted responsibility for a medical error were more likely to report constructive changes in behavior in response to the error than were others who attributed errors to system factors such as high workload. Considering the patient safety and attribution literature together raises the question of whether preventable adverse events seen as causally heterogeneous promote group- and organization-level learning but limit individual learning. This tension between the roles of systems as a source of learning versus the individual as a source of learning, as noted, is fundamental to the patient safety literature and therefore leads us to suggest:

> *Proposition 1c:* The extent to which individuals attribute preventable adverse events to their own error will trigger greater individual learning compared with when they attribute events to organizational or administrative factors.

Group-Level Factors

Group learning is shaped by how group members interpret and integrate other members' knowledge and experience to promote collective learning (e.g., Crossan et al., 1999). Group learning refers to a process in which a group takes action, obtains and reflects upon performance feedback, and makes changes to adapt or improve (Edmondson, 1999). For a group to engage in collective learning, group members need to be willing to share their knowledge and experience and arrive at a common understanding of what that experience and knowledge mean. Past research shows that collective learning can be shaped by contextual and sociopsychological factors, including team structure, team efficacy, members' perception of power relationships, team tasks (Edmondson, 2002), and team empowerment (Gibson & Vermeulen, 2003). Below, we discuss four factors shown to shape collective learning in other contexts.

Group diversity. Research on group diversity has suggested that groups can gain from diverse knowledge and experience embedded in its members (Williams & O'Reilly, 1998). Diverse perspectives can stimulate constructive conflict around issues and appropriate actions, in turn improving group performance, especially on complex tasks (Jehn, Northcraft, & Neale, 1999). Past research has demonstrated the link between group diversity and group performance on cognitive tasks; however, to date, no studies have investigated how group diversity affects group learning from failure. Heterogeneous work groups that bring together diverse sets of knowledge and experience from multiple health care disciplines (e.g., nursing, medicine, pharmacy, engineering, and management) have been shown to enhance clinical performance and quality (Mohr & Batalden, 2002). March, Sproull, and Tamuz (1991) suggest that homogenous groups will have a far more limited capacity to understand the multitude of factors responsible for preventable adverse events that they

encounter than will heterogeneous groups, and that their search for solutions is likely to provide a more limited number of alternatives. Accordingly,

> *Proposition 2a:* Heterogeneity of group members' knowledge and experience with preventable adverse events will have a positive impact on group learning from preventable adverse events.

Intergroup linkages. Capability to learn from preventable adverse events may also depend on accessibility to external knowledge and information. Research on social networks suggests that the web of relationships among groups within an organization facilitates knowledge transfer among them (e.g., Reagans & McEvily, 2003) and influences group performance (Oh, Chung, & Labiance, 2004) because groups can learn from the experience of others. In health care organizations, intergroup linkages can be formal or informal. Formal linkages may be developed within a health care organization through such practices as the use of resource staff with specialty skills in an area like quality improvement who work across multiple units in the organization. In one study, resource staff were found to be effective contributors to nurses' responses to failure because they possess a specific and unique set of process improvement skills and because they work across functional and professional boundaries, bringing together knowledge and experiences from relevant groups in the failure resolution process (Tucker & Edmondson, 2002). For informal intergroup linkages, the linkages formed through members' social relationships within a health care organization represent group social capital and allow individuals access to knowledge, information, experience, support, and work-related resources of others (e.g., Reagans & McEvily, 2003). Informal linkages can also stem from individuals' personal relationships with colleagues to whom they may turn for advice when experiencing poor performance.

As such, both informal and formal intergroup linkages can enhance the capacity of health care work groups to learn from preventable adverse events. The diversity in knowledge, experience, and professional training that are accrued through these linkages can aid in failure resolution processes and prevent similar failure in the future. Accordingly,

> *Proposition 2b:* Intergroup linkages consisting of diverse knowledge and resources specific to adverse events within an organization will have a positive impact on group learning from preventable adverse events.

Group norms. While heterogeneity of group members' knowledge and experience with preventable adverse events and intergroup linkages promote group learning from preventable adverse events, the propensity of group members to engage in collective learning can be shaped by social influences such as group norms. Group norms define appropriate behavior of group members, which in turn shape group processes and outcomes. Group norms can affect an individual's willingness to respond to adverse events. Group norms that promote openness are more likely to permit or encourage the reporting of preventable adverse events, thereby legitimizing failure events (Sitkin, 1992) and allowing individuals to exercise their knowledge and experience to respond to these events. It has been suggested that organizations with staff who feel unable to voice their concerns will fail to identify, investigate, and learn from failures (Walshe, 2003). Norms of openness limit the kind of communication failures associated with incident reporting and investigation (Walshe, 2003) and medical mishaps more broadly. Edmondson (1999) found that a lack of team psychological safety—defined as the belief that one is at risk if he or she speaks openly—can inhibit group learning. A norm of openness allows group members to challenge the status quo, thereby avoiding the negative consensus-seeking tendencies associated with groupthink (Janis, 1982). A norm of openness also supports the use of constructive conflict in groups which has been found to improve performance on complex tasks (Jehn et al., 1999) and to improve decision making (e.g., Schweiger, Sandberg, & Ragan, 1986). By sharing information and knowledge and by allowing constructive conflict, group members may be better able to identify and reflect upon the factors contributing to preventable adverse events and they may be better able to learn from them. Accordingly, it is anticipated that norms of openness and use of constructive conflict within health care work groups will help groups to identify preventable adverse events and generate strategies to learn from them to reduce future occurrences.

> *Proposition 2c:* Group norms of openness and norms that encourage the use of constructive conflict will have positive impacts on group learning from preventable adverse events.

Leadership style. Participative leadership is closely linked with and helps to foster a norm of openness as well as the use of constructive conflict at the group level (Leana, 1985). Group-level learning is explained less by differences in group type or structure and more by interpersonal perceptions and views of power and authority (Edmondson, 2002; Pisano, Bohmer, & Edmondson, 2001). In their work on rates of learning related to the introduction of minimally invasive cardiac surgery, Pisano et al. (2001) found that differences in learning rates could be explained, among other things,

by team leaders who use coaching behaviors that encourage group members to speak freely and openly. This kind of leadership and interpersonal skills has been found to be more important with respect to learning in interpersonally threatening situations, such as those that address patient safety, than in technical situations (Friedman, 2001). In addition, given the competing priorities in health care, the local leadership approach must value safety, set it as a priority, and hold group staff accountable for actions in this area. Although this balance is sometimes challenging (e.g., Firth-Cozens, 2001), it is anticipated that,

Proposition 2d: Participative leadership approaches that value safety will have a positive impact on group learning from preventable adverse events.

Organizational-Level Factors

The propensity of an organization to learn is likely to be affected by how well prior knowledge and experience are managed and codified (Nonaka & Takeuchi, 1995), institutionalized beliefs and values shared among organizational members (Crossan et al., 1999), and information accessibility of an organization (e.g., Darr, Argote, & Epple, 1995). Accordingly, we propose that organizational-level factors, including safety management systems, safety culture of the organization, leadership for safety, and interorganizational networks, all contribute to the values that are institutionalized and the information and shared experiences of organizational members.

Safety management systems. Past research has suggested that the transfer of learning experience within an organization can be difficult (Szulanski, 2003). A knowledge management system facilitates the transfer of learning experiences by disseminating a set of formal procedures and mechanisms that capture information on the best practices throughout the organization (Nonaka & Takeuchi, 1995). Knowledge management systems aid in the codification of knowledge and store what has been learned in the past, thus helping an organization as a whole to understand, extend, and codify the knowledge, information, and outcomes associated with its past experience.

In health care organizations, safety management systems such as incident reporting systems may be used to codify reported adverse events, including systematic information on causality. Although the effectiveness of such systems depends on the completeness of reporting and codification, these systems can record accumulated knowledge and experiences associated with preventable adverse events. Successfully used in the aviation industry to aggregate data on incidents and near misses, safety management systems have greatly reduced aircraft accidents. However, in health care, full use of these systems has not yet been made, in large part due to professionals' unwillingness to acknowledge and report errors (e.g., Nieva & Sorra, 2003) and to lack of feedback provided to those who report incidents (Evans et al., 2006). An effectively used safety management system would allow health care organizations to review past procedures and practices and modify future ones so as to reduce additional preventable adverse events. Thus,

Proposition 3a: Effectively used safety management systems will have a positive impact on organizational learning from preventable adverse events.

Formal leadership. Organizational leadership for patient safety can facilitate important learning from preventable adverse events (Sitkin, 1992). Sadler (2001) brings together work on leadership at the organizational level and organizational learning in the concept of "learning leaders." Learning leaders are those who promote openness and facilitate others' learning through mentorship, put incentives and resources in place, and foster a "pro-learning culture, including such principal characteristics as tolerance of mistakes and avoidance of blame, absence of non-invented here attitudes, a high level of cross functional and interdisciplinary integration. . ." (Sadler, 2001, p. 426). This concept of the learning leader embodies many of the critical characteristics required for safer systems (e.g., blame avoidance and cross-functional integration). In health care, senior leadership commitment to quality and improvement has been found to explain a significant amount of variance in nurse leader perceptions of patient safety culture (Ginsburg, Norton, Lewis, & Casebeer, 2005) as well as perceptions of usefulness of health care performance data (Ginsburg, 2003). Both studies also showed that senior leadership that values improvement is noticed by frontline unit managers and is positively related to their assessments of the importance of patient safety and improvement to the organization. We anticipate that executive leadership for patient safety will have a significant impact on organizational learning from preventable adverse events.

Proposition 3b: Leadership for patient safety will have a positive impact on organizational learning from preventable adverse events.

Organizational culture. As an organizational variable, culture "emerges from that which is shared between colleagues in an organization, including shared beliefs, attitudes, values, and norms of behaviour. . .it is 'the way things are done around here' as well as the ways things are understood, judged, and valued" (Davies, Nutley, & Mannion, 2000, p. 112). Thus, organizational

culture serves as a social control system, promoting shared values and beliefs among members and guiding members' behavior.

In health care, a safety culture is one way that issues related to adverse events and patient safety can be understood, judged, and valued. Leape et al. (1998) argue that a culture that acknowledges risk is necessary to make health care safer. Ginsburg et al. (2005) have identified three safety culture factors: fear of repercussions, state of safety, and valuing safety at the department and organizational level. Leape et al. suggest that there is a need to move from a "culture of blame that hides information about risk and error into a culture of safety that flushes information out and enables us to prevent or quickly recover from mistakes before they become patient injuries" (p. 1447). Others suggest that safety culture and learning are more intimately linked—where safety culture is seen as a "process of collective learning" (Mohr, Abelson, & Barach, 2002; Westrum, 2004). Firth-Cozens (2001) actually suggests that a culture of safety exists to permit individuals and teams to learn from errors. Indeed, a strong patient safety culture may be nearly synonymous with learning from preventable adverse events. Accordingly, we argue that organizations with a culture that values patient safety will be more likely to learn from preventable adverse events. Thus,

> *Proposition 3c:* Safety culture will have a positive impact on organizational learning from preventable adverse events.

Network contacts. Like individuals and groups, organizations can learn from the experiences of other organizations, using their experiences to guides their own actions (Levitt & March, 1988). Vicarious and imitative learning such as this has been observed in health care contexts. For example, Burns and Wholey (1993) reported that U.S. hospitals imitated the organization design decisions (both adoption and subsequent abandonment) of high-prestige hospitals. In other industries, interorganizational networks have been shown to facilitate learning transfer—helping the transfer of operating experience in service organizations (e.g., Darr et al., 1995).

We argue that the network contacts of key decision makers in health care organizations will significantly influence their organization's ability to learn from preventable adverse events. Network contacts of the decision makers can serve as an organization's social capital through access to external information and knowledge. The diverse knowledge and experience embedded within their network contacts help the decision makers to understand the underlying causes of preventable adverse events, which in turn facilitate the development of knowledge and practices to prevent similar events from occurring in the future. Accordingly,

> *Proposition 3d:* Network contacts of key decision markers consisting of diverse knowledge and experience specific to preventable adverse events will have a positive impact on organizational learning from preventable adverse events.

Discussion

Preventable adverse events in health care organizations not only have serious consequences for patients and organizational members, but they also have tremendous social costs (Kohn et al., 1999). Learning theorists have long emphasized that failure can induce learning and can be an important driver for improving organizational performance and reliability (Levitt & March, 1988; Miner et al., 1999; Sitkin, 1992). However, recent learning studies have just begun to accumulate empirical evidence from various industries to understand what factors contribute to learning from failure (Chuang & Baum, 2003; Haunschild & Sullivan, 2002). The evidence to date has focused primarily on the organizational level. Our attention to the factors situated at different levels influencing learning processes at the group and organization levels provides one of the first systematic examinations into the capacity associated with learning from failure at multiple levels and is one of the first to be situated in a health care organizational context.

Although we propose the main effects of perceived characteristics of the events, attribution processes, group factors, organizational factors, and an interorganizational factor on learning from preventable adverse events, it is likely that many of these factors *interact* to influence learning. We also expect that certain organizational factors may moderate the effects of group factors on group learning similar to the moderator effects shown by Zohar, Livne, Tenne-Gazit, Admi, and Donchin (2007) with respect to group and organizational climate interacting to predict medication safety. For reasons of parsimony, we do not extend our model to moderator effects here. Our work represents early, but critical, efforts to build a multilevel model of learning from failure.

Limitations of the Model and Future Research

The proposed model is subject to limitations, some of which suggest avenues for future research. First, the model applies to situations where preventable adverse events occur and are recognized as such by those involved. However, ambiguity surrounding definitions of preventable adverse events can affect the discovery of

these events (Tamuz et al., 2004). For instance, preventability and adverse outcomes involving prolonged hospitalization (at a minimum) are inherent aspects of the definition of a preventable adverse event. Providers might then identify gray areas surrounding what constitutes preventability. In addition, comorbidity (preexisting secondary diagnoses) found among most elderly hospitalized patients can make it difficult to attribute prolonged hospitalization to an adverse event. Additional research is required regarding how to reduce definitional ambiguity (Sutcliffe, 2004; Tamuz et al., 2004) to try to understand what kinds of incidents and events constitute clear learning opportunities from the perspective of health care providers and managers.

Learning theories also point out that near-failure events can be valuable engines for triggering organizational learning (Miner et al., 1999). In the context of health care, near misses would constitute near-failure events. A near miss is defined as an act of commission or omission that could have harmed the patient but did not cause harm as a result of chance, prevention, or mitigation (Institute of Medicine, 2004). Although such events, by definition, do not produce immediate harm to patients or operations, they represent potential adverse events (Bates et al., 1995) and may provide useful insights regarding the improvement of clinical or administrative processes (Sutcliffe, 2004) without the negative outcomes that are inherent in adverse events. Future research into the relationship between near misses and learning in health care is warranted, including consideration of whether some of the variables we identify may also influence learning from near misses.

Finally, future research might empirically test the multilevel model proposed here. For instance, surveys of staff, frontline managers, and organization safety leaders could be used to collect data on each construct in the proposed model, with staff and frontline managers providing data on the unit- and organizational-level practices that they have knowledge of and safety leaders providing other organization-level data. Validated measures exist that could be used for several of the constructs in the model proposed here (e.g., safety culture: Ginsburg et al., 2005; norms around conflict: Jehn et al., 1999). This survey design would produce nested data for a multilevel model that could be appropriately analyzed using multilevel analyses such as hierarchical linear modeling. Alternatively, or in addition, qualitative approaches could also be used to examine the proposed model. For instance, semistructured interviews and focus groups could be used with staff and managers at the unit and organization levels to identify the factors that influence learning to see whether the identified factors are consistent with those in the proposed model. Such an approach could help validate and extend this model. Finally, because types of preventable adverse events and effective learning behaviors can vary across different health care settings such as acute and chronic care settings, it is imperative to tailor the events and the behaviors to specific health care contexts when testing the proposed model.

Practice Implications

Our model suggests several actionable practices to enhance unit and organizational learning capacity and improve responsiveness to preventable adverse events. First, groups and organizations can and should carefully consider our definition of learning from preventable adverse events as it includes practical guidelines for how groups and organizations could respond more effectively to these events. As outlined in Defining learning, learning from patient safety failures such as preventable adverse events involves explicit actions of individuals, groups, and organizations related to the reporting of the events, analysis of their causes, and implementation of changes designed to prevent similar failures in the future (Sasou & Reason, 1999). Second, at the group level, managers can and should work on establishing group norms within their units that value openness and encourage the use of constructive conflict when discussing preventable adverse events. Open communication and information sharing are argued in this article to promote learning and have also been suggested to foster a positive culture of safety (Westrum, 2004). Accordingly, critical reflection by managers about the type of behaviors they are promoting at the unit level is strongly encouraged (Huang et al., 2007; Zohar et al., 2007)—for instance, managers should carefully consider things such as whether people or the system are blamed following an event, whether staff feel psychologically safe to report preventable adverse events, and whether staff actions to identify and address safety concerns are rewarded or disregarded.

Third, our discussion of the importance of heterogeneity within units and organizations has useful practice implications at the organizational level. Organizations should consider whether they are structured in such a way that patient care units are made up of people with the kind of diverse knowledge and experience proposed to enhance learning. For instance, having pharmacists as full-time members of unit care teams where they participate in daily patient rounds may better enhance group learning capacity from preventable adverse events in that they can contribute to diverse knowledge and experience at the group level. Fourth, the proposed model suggests that organizations should consider appointing formal safety leaders and make efforts to attract opinion leaders in this area to promote organizational learning capacity. Finally, managers must make efforts to establish channels for information and knowledge

transfer between care units and with other organizations because these approaches may provide effective means for enhancing learning capacity for the organizations as a whole.

Conclusion

By building on work in organizational learning and organizational behavior, our model of learning from preventable adverse events in health care organizations effectively responds to suggestions in the literature that cognitive psychology, organization studies, and other disciplines have much to offer in the study of safety in health care. Indeed, much of the organizational literature suggests that organizations are myopic, tending to pursue what they know rather than exploring new strategies and only learning and changing in response to glaring performance failures (Levitt & March, 1988). Beyond learning from preventable adverse events and considering multiple levels of analysis, we see many ways to enhance patient safety in health care organizations through the model outlined here.

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