

Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams

INGRID M. NEMBHARD^{1*} AND AMY C. EDMONDSON²

¹Graduate School of Arts and Sciences, Graduate School of Business Administration, Harvard University, Boston, Massachusetts, U.S.A

²Graduate School of Business Administration, Harvard University, Boston, Massachusetts, U.S.A.

Summary

This paper introduces the construct of *leader inclusiveness*—words and deeds exhibited by leaders that invite and appreciate others' contributions. We propose that leader inclusiveness helps cross-disciplinary teams overcome the inhibiting effects of status differences, allowing members to collaborate in process improvement. The existence of a professional hierarchy in medicine and the differential status accorded to those in different disciplines is well established in the health care literature, as is the need for quality improvement. We build on this foundation to suggest that profession-derived status is positively associated with psychological safety (H1)—a key antecedent of speaking up and learning behavior—in health care teams. We hypothesize that this effect varies across teams (H2), and furthermore, that leader inclusiveness predicts psychological safety (H3) and moderates the relationship between status and psychological safety (H4). Finally, we suggest psychological safety predicts *engagement in quality improvement work* (H5) and mediates the relationship between leader inclusiveness and engagement (H6). Survey data collected in 23 neonatal intensive care units involved in quality improvement projects support our hypotheses. These results provide insight into antecedents of and strategies for fostering improvement efforts in health care and other sectors in which cross-disciplinary teams engage in collaborative learning to improve products or services. Copyright © 2006 John Wiley & Sons, Ltd.

Introduction

In today's complex organizations, teams are increasingly valued for their potential to innovate, solve problems, and implement change. A growing literature on team learning identifies factors that allow

* Correspondence to: Ingrid M. Nembhard, Graduate School of Arts and Sciences, Graduate School of Business Administration, Harvard University, Soldiers Field Road, Boston, MA 02163 U.S.A. E-mail: inembhard@hbs.edu

Contract/grant sponsor: Harvard Business School Division of Research.

Received 28 January 2005
Revised 15 September 2005
Accepted 29 June 2006

teams to experiment, reflect, and improve across a range of industry settings (Bunderson, 2003a, 2003b; Edmondson, 1999; Gibson & Vermeulen, 2003). Few industries have more at stake when teams learn—or fail to learn—than health care. Increasingly, cross-disciplinary teams are responsible for delivering care to patients in settings ranging from primary care to critical acute care, chronic care, geriatrics, and end-of-life care (Institute of Medicine, 2001). These teams face not only a daunting expansion of medical knowledge but also increasing specialization that divides critical knowledge among individuals—knowledge that must be integrated for the delivery of *quality* care, as well as for improving care.

In this environment, the combined challenges of teamwork and learning are emerging as central to the health care delivery enterprise, in particular because research has shown that 70 to 80% of medical errors are related to interactions within the health care team (Schaefer, Helmreich, & Scheidegger, 1994). This article seeks to advance theory in organizational behavior and health care management by proposing and testing a model of engagement in team-based quality improvement work. In the next section, we review critical trends in health care delivery to set the stage for our model and empirical research.

Dynamic trends in health care

Health care professionals today face a staggering rate of change in medical knowledge. Whereas in 1966, only 100 published articles reported on randomized control trials—in medicine, the “gold standard” for recognizing new knowledge—1995 brought more than 10,000 (Chassin, 1998). In terms of sheer volume of new information, the Medline bibliographic database adds 30,000 new references each month, and the Federal Drug Administration reviews thousands of applications for new devices and drugs annually (Shine, 2002). No single individual can absorb all of this new knowledge in a timely manner. Nevertheless, new knowledge must be absorbed for continued effectiveness in health care delivery.

A second crucial trend is the increasing specialization of health care professionals (Hafferty & Light, 1995). Prior to 1930, there were only two boarded medical specialties (ophthalmology and otolaryngology). Today, there are 26 specialties and 93 subspecialties within the major specialties, 8 of which were approved during the 2002–2003 accrediting year (Accreditation Council for Graduate Medical Education, 2004). Thus, the scope of an individual physician’s domain of expertise has diminished, while depth of expertise has increased. At the same time, a growing number of non-physician professions have joined the patient care enterprise. Specialists in nutrition, respiratory therapy, physical therapy, phlebotomy, and so on, have joined nurses as non-physician caregivers, playing vital roles in the health care system. In 1900, the ratio of physicians to non-physicians was 1 in 3; by 2000, it had exploded to 1 in 16 (Shine, 2002), implicating greater fragmentation of expertise, and more hand-offs in the patient care process (Leape et al., 1995). Today, an increasing number of different caregivers treat each patient at the bedside. Each brings information necessary and relevant for development of a cohesive care plan.

A third trend—almost a necessary outcome of the first two—is increasing interdependence. Many new technologies and care practices involve reciprocal (as opposed to sequential) interactions. Caregivers cannot simply do their jobs and assume others will come along at some point to do theirs. Instead, their knowledge and efforts must be integrated to deliver quality care.

These trends—increasing knowledge, specialization, and interdependence—which are more prominent in health care than in other industries, together imply a need for collaborative learning in groups of professionals from different disciplines. The modern intensive care unit (ICU) is said to

exemplify the confluence of these factors (Wachter, 2004), but all health care settings have been touched by these trends. Collaboration—defined as “physicians and nurses [and other caregivers] working together, sharing responsibility for solving problems, and making decisions to formulate and carry out plans for patient care” (Baggs et al., 1999, p. 1991)—requires open communication and mutual respect in addition to collective decision making (Baggs et al., 1999; Brown, Ohlinger, Rusk, Delmore, & Ittmann, 2003; Zimmerman et al., 1993) and is critical to care delivery. Health professionals themselves have recognized the imperative for teamwork in clinical care and quality improvement, even suggesting that the latter needs to be based in cross-disciplinary teams (Donaldson & Mohr, 2000), a suggestion that has been embraced by many (e.g., Berwick, Godfrey, & Roessner, 1990; Horbar, 1999).

Barriers to collaborative learning in health care

Despite the need for collaborative learning in cross-disciplinary teams in the health care setting, team-based quality improvement efforts may stall for a number of reasons. First, the stakes are undeniably high. Human life is at risk when processes fail, creating understandable risk aversion that can inhibit willingness to engage in the chaos and uncertainty of team brainstorming and experimentation. It is noteworthy that studies of other high stress environments have shown that improvement efforts tend to be centralized and hierarchical rather than collective and democratic (Driskell & Salas, 1991; Foushee & Helmreich, 1988; Hermann, 1963; Klein, 1976; Staw, Sandelands, & Dutton, 1981).

Second, cross-disciplinary teamwork—intended to integrate knowledge and expertise from different sources—is difficult to carry out in practice (e.g., see Edmondson, Roberto, & Watkins, 2003 for a review). Improving the quality of care delivery processes necessarily requires different viewpoints, each grounded in deep knowledge of a different aspect of the process. Physicians possess specialized medical expertise, while nurses and allied health workers (e.g., respiratory therapists and dietitians) have greater knowledge of daily patient-interaction processes. In combination, they contain a more comprehensive information base. However, information often goes unshared. A recent study showed that, although nurses witness and experience a variety of problems and employ a number of creative solutions to resolve emergent issues, they generally do not communicate these to others in the hierarchy (Tucker & Edmondson, 2003). Thus, despite its importance for improving care delivery, collaborative learning does not occur naturally in health care.

Third, and a central focus of this paper, a well-entrenched status hierarchy exists in medicine, making it difficult to speak across professional boundaries (e.g., physician vs. nurse vs. therapists) to collaborate for learning (Edmondson, 2003). The medical training that instills a culture of autonomy for action can diminish professionals' tendencies to seek opportunities to learn to communicate, share authority, and collaborate in problem-solving and quality improvement (Institute of Medicine, 1999, 2001). Unfortunately, this reluctance can adversely affect patient care. Patient outcomes are significantly correlated with the degree of hierarchy in health care team interactions (Feiger & Schmitt, 1979). According to a recent report, *Keeping Patients Safe: Transforming the Work Environment of Nurses*, “counterproductive hierarchical communication patterns that derive from status differences” are partly responsible for many medical errors (Institute of Medicine, 2003, p.361). In a content analysis of medical malpractice cases from across the country, physicians (the high-status members of the team) were shown to have ignored important information communicated by nurses (the low-status members of the team), and nurses also withheld relevant information for diagnosis and treatment from physicians (Schmitt, 1990). In this status-consciousness environment, opportunities for learning and

improvement can be missed because of unwillingness to engage in quality-improving communication due to fear of reprisal by high-status others.

Aims of the present study

The present study investigates factors that promote engagement in quality improvement work when status differences are present in teams. We examine the relationship between status and psychological safety, and introduce the construct of *leader inclusiveness*, defined below, as a moderator of the status–psychological safety relationship. We then assess whether psychological safety mediates the relationship between leader inclusiveness and engagement in improvement efforts. At a time when quality improvement in health care is viewed as imperative, we aim to provide insight into how to overcome an important barrier to quality improvement learning efforts.

The implications of this study extend beyond the health care industry, however. With customer heterogeneity, a high need for customization, and a highly specialized workforce, hospitals present a challenging, but by no means unique, service setting. Furthermore, the use of cross-disciplinary teams continues to rise across industries as organizations seek to learn and innovate to remain competitive (Griffin, 1997; Sarin & Mahajan, 2001; Wind & Mahajan, 1997). The salience of status in health care though provides an opportunity to investigate its effects on team-based improvement efforts and reveal implications for other organizations that use teams encompassing status differences to improve products or services. Therefore, our aim is to contribute to knowledge of the role of status in shaping perceptions of psychological safety and, more broadly, the conditions that support improvement and learning in cross-disciplinary teams.

Collaborative Learning in Cross-Disciplinary Health Care Teams

Status in professional hierarchies as a determinant of psychological safety

Status refers to the level of prominence, respect, and influence associated with an individual as a result of some characteristic (Anderson, John, Keltner, & Krings, 2001), such as age, education, ethnicity, gender, organizational position, profession, wealth, etc. (Bacharach, Bamberger, & Mundell, 1993; Benoit-Smullyan, 1944). According to status characteristics theory, personal characteristics affect self- and other-assessments and beliefs about the individual and his or her performance abilities (Berger, Cohen, & Zelditch, 1972; Berger, Rosenholtz, & Zelditch, 1980). Status characteristics can be “diffuse” meaning they are applicable over a range of settings (e.g., age, gender, or ethnicity) or “specific” meaning they provide cues about a person’s expertise relative to a task (e.g., education or professional training). In either case, individuals that possess the esteemed characteristic or more of that characteristic are judged superior to those with less of that attribute. Thus, status indicates relative position within a social hierarchy (Benoit-Smullyan, 1944).

In the United States, social status is often role- or profession-based. Status differences are thus “most salient in the work context where they often have practical implications (e.g., education level determining pay level)” (Bacharach et al., 1993, p. 24). Higher status individuals receive more tangible

and intangible benefits in the workplace than their lower ranked co-workers. They gain power over the actions of others (e.g., determining co-worker schedules and tasks), prestige or the right to occupy honorary places (e.g., a windowed corner office), a reputation for significant contributions leading to greater solicitations of their opinions, the benefit of the doubt in ambiguous situations, and financial rewards (e.g., higher salary and department budgets).

The allocation of benefits which favors high-status individuals over lower status individuals shapes the environment they share as well as interpersonal interactions (e.g., Alderfer, 1987). Individual awareness or beliefs that membership in a particular group (e.g., profession) bestows a certain level of status creates feelings of superiority or inferiority that consistently govern behavior so as to preserve the hierarchy (Tajfel & Turner, 1986; Webster & Foschi, 1988). Compared to high-status individuals, those with low status are more likely to suffer low self-efficacy and underestimate their contribution to work tasks (Berger, Fisek, Norman, & Zelditch, 1985), and therefore withhold valid information (Argyris, 1985), defer decision rights to higher status others (Driskell & Salas, 1991), limit their organizational citizenship behavior (Stamper & Van Dyne, 2001), and speak less (Kirchler & Davis, 1986; Pagliari & Grimshaw, 2002; Vinokur, Burnstein, Sechrest, & Wortman, 1985; Weisband, Schneider, & Connolly, 1995). Consequently, organizations rely heavily on high-status individuals, which is beneficial when status corresponds to the expertise required for the task. However, empirical research suggests that individuals often fail to recognize the expertise held by multiple team members—to the detriment of group and organizational goals (e.g., see Littlepage, Robison, & Reddington, 1997). Organizational innovation and improvement, in particular, suffer when minority opinions are ignored (Nemeth, 1986). Nevertheless, inadequate identification of valid contributions continues because social hierarchy leads to the domination of high-status individuals and self-censoring by low-status individuals. The latter relates to perceptions of risk to self and fear of negative repercussions (e.g., public reprimand or assignment to a “bad” work shift).

Research on organizational silence indicates that sense of threat and/or risk is a key determinant of employees’ willingness to speak up freely (Ashford, Rothbard, Piderit, & Dutton, 1998; Detert & Edmondson, 2005; Edmondson, 2003; Milliken, Morrison, & Hewlin, 2003; Morrison & Phelps, 1999; Ryan & Oestreich, 1991). Speaking up freely occurs when people are not constrained by the possibility of others’ disapproval and/or the negative personal consequences that might accrue to them as a result—a state of psychological safety. In most organizations, those with high status have more control over formal appraisals and resources than those with low status, and thus may experience a certain freedom of self-expression in front of others, that low-status individuals do not enjoy. Research on politeness shows that those with low status employ more “facework” (face saving verbal strategies) when addressing those with higher status than the other way around (Brown & Levinson, 1987). With increased status, people exercise less concern about damaging others’ face; opinions can be freely voiced, and requests can be made of others without verbal compensation to convey apology, humility, or deference. This well-documented inverse relationship between status and politeness suggests corresponding differences in psychological safety across different status groups.

In general, high-status individuals tacitly assume that their voice is valued. People with high status—role-based and demographic—are more likely to be asked for their opinion than those with low status. Accustomed to having their opinions sought—often in formal capacities—they learn to offer them freely. They thus do not perceive the same level of interpersonal risk associated with self-expression experienced by those with low status. Qualitative evidence of this difference in psychological safety according to status was found in Kahn’s (1990) study of an architectural firm and a summer camp; informants described their interactions with those positioned higher in the hierarchy as more stifling and threatening than their interactions with peers. Lower status individuals in Kahn’s study reported a

lack of confidence that higher status individuals would not embarrass or reject them for sharing contradictory thoughts.

Individuals in lower positions in the medical hierarchy (Helmreich, 2000) may feel a similar sense of fear about speaking up across status boundaries, for example, to raise a concern or challenge a current practice. The existence of a professional hierarchy in medicine and the differential status accorded to those who occupy different positions within that hierarchy is well-known to health professionals and well established in the health care literature (Coburn, 1992; DeSantis, 1980; Dingwall, 1974; Friedson, 1970a,b; Fuchs, 1974; Hafferty & Wolinsky, 1991; Shortell, 1974; Wolinsky, 1988). We know that surgeons garner more prestige than other specialty physicians, that specialty physicians rank above primary care physicians, that physicians possess more power than nurses, nurses than physical therapists, and so on. The hierarchy and related status differences exist within professional groups (e.g., physicians: specialists vs. primary care) and between groups (e.g., physicians vs. non-physicians), with between group status differences being most salient and largest. We therefore predict, based on prior research on the behaviors of different status groups, that non-physicians, as lower status health professionals, view the cross-disciplinary team climate as less psychologically safe than higher status individuals such as physicians:

Hypothesis 1 (H1): In cross-disciplinary teams, higher status individuals will experience greater psychological safety than lower status individuals. (In cross-disciplinary health care teams, physicians will experience more psychological safety than nurses, who will experience more psychological safety than respiratory therapists).

The proposed main effect between status and psychological safety may vary depending on how status differences are handled in a work group. Prior research found that psychological safety can vary significantly across groups, even within the same strong organizational culture (Edmondson, 1996, 1999). Bringing together professionals with different backgrounds and expertise may exacerbate this variance, if some groups handle the challenge of managing these differences more skillfully than others (Bunderson, 2003b). When status differences are present in a team, team members must manage a tension between the norms of collaboration that underlie the notion of teamwork and the reality of status differences. Prior research showed that the degree of status derived from different professions can vary across cross-disciplinary work groups (Bunderson, 2003a). Similarly, the formal status associated with a given profession in health care may be treated differently in different work groups called “units” in health care. The unit is a cross-disciplinary care team, consisting of all of the staff that participates in delivering a specific domain of clinical care, for example, intensive care or cardiac care. Differences in status handling across work groups in other settings suggests the effect of role-based professional status on psychological safety will also vary across cross-disciplinary unit teams—indicating an interaction effect between status and unit team membership on psychological safety:

Hypothesis 2 (H2): Status and unit team membership will interact to predict psychological safety.

Bunderson (2003a) identified two group attributes—average tenure and power centralization—that helped explain differences in status effects across groups, and suggested that future research consider alternative moderators such as task interdependence (Wageman, 1995) and task uncertainty (Van de Ven, Delbecq, & Koenig, 1976). Other research suggests that how work is organized affects status relationships. In their study of specialized AIDS units versus general medical units treating AIDS patients, Aiken and Sloane (1997) found that the relative status of nurses was increased after the conversion to specialized units. They attributed the elevation in status to an increased appreciation for nurses’ specialized knowledge and client differentiation. We explore another possibility—that leader

behavior, particularly in its level of inclusiveness, can frame the meaning of status differently across units, even with similar structures or work design (Edmondson, 2003), helping to explain why status effects might vary across work groups.

Leader inclusiveness

Team leader behaviors, in general, have been shown to affect the internal dynamics of a team, in particular influencing team climate and learning orientation (Baker, Murray, & Tasa, 1995; Edmondson, 1999; Hult, Hurley, Guinipero, & Nichols, 2000; Madhavan & Grover, 1998; Norrgren & Schaller, 1999; Shortell, Rousseau, Gillies, Devers, & Simons, 1991; Yukl, 1994; Zimmerman et al., 1993). Team members are highly attuned to the behavior of leaders and examine leader actions for information about what is expected and acceptable in team interactions (Tyler & Lind, 1992). If a leader takes an authoritarian, unsupportive, or defensive stance, team members are more likely to feel that speaking up in the team is unsafe. In contrast, if a leader is democratic, supportive, and welcomes questions and challenges, team members are likely to feel greater psychological safety in the team and in their interactions with each other.

Preliminary evidence of leadership effects on psychological safety emerged in a study of medication errors in nursing teams (Edmondson, 1996). In some units, nurses described nurse managers as authoritarian and also expressed deep fears about being reprimanded for revealing mistakes. In contrast, nurses in other units felt safe speaking up about errors because their nurse manager had stressed the importance of using this information as a learning tool for the unit. In a later study of cardiac surgery teams, qualitative data suggested that teams with leaders who actively invited others' input had higher psychological safety than those in which this behavior was absent. Qualitative data suggested that surgeon team leaders handled status differences within their teams differently (Edmondson, 2003). Although all teams comprised four professional roles, with clear traditional status differences, in some, the surgeons (those with the highest status) made an explicit effort to invite others' input to help the team implement a new technology. In other teams, the leaders were not similarly proactive.

Building on these qualitative insights, we propose the construct of *leader inclusiveness*, defined as words and deeds by a leader or leaders that indicate an *invitation* and *appreciation* for others' contributions. Leader inclusiveness captures attempts by leaders to include others in discussions and decisions in which their voices and perspectives might otherwise be absent. It is related to team leader coaching behavior, which describes team leader behaviors that facilitate group process and provide clarification and feedback (Baron, 1990; Edmondson, 1999), and to participative leadership, which describes leaders that consult with workers, participate in shared decision-making and delegate decision-making authority to subordinates (Bass, 1990; McGregor, 1960; Yukl, 1994). Leader inclusiveness differs from these constructs in that it directly pertains to situations characterized by status or power differences *and* pertains more narrowly to behaviors that invite and acknowledge others' views. The established constructs did not capture sufficiently the difficulty of lower social position, nor the behavior of explicit invitation designed to overcome communication boundaries.¹

Leader inclusiveness describes behavior that, through direct invitation, should create psychological safety for speaking up. We suggest that both invitation and appreciation are needed to convey the

¹More specifically, team leader coaching describes the leader as an operational facilitator; participative leadership emphasizes harnessing employee motivation to maximize productivity. Thus, neither construct is intended—as is leader inclusiveness—to address status salient environments, nor to identify the two-pronged strategy of invitation and appreciation.

inclusiveness that helps people believe that their voices are genuinely valued. Without a recognizable invitation, impressions derived from the historic lack of invitation will prevail. And without appreciation (i.e., a positive, constructive response), the initial positive impact of being invited to provide input will be insufficient to overcome the subsequent hurdle presented by status boundaries. Defining leader inclusiveness in this way, we hypothesize that:

Hypothesis 3 (H3): Leader inclusiveness is positively associated with psychological safety.

Finally, we predict that leader inclusiveness will alter the status–psychological safety relationship as follows. When leaders demonstrate inclusiveness, lower status others are likely to feel supported and to believe the leaders see them as important members of the team. An atmosphere of mutual respect across the different professions may develop, in which the specialized expertise held by those with low status is seen as valuable to the team’s shared task. This helps to equalize the value associated with all members’ contributions, promoting an egalitarian context. These efforts may increase the level of psychological safety felt by everyone in the team, but the effect is likely to be greater for low-status individuals who have less prior experience with others expressing interest in their input than it will be for those with high status. In contrast, when leader inclusiveness is low, a lack of opportunity to overcome traditional status barriers allows them to prevail, such that low-status individuals fail to experience an elevation in psychological safety, leaving high-status individuals more advantaged in this respect. Thus, we hypothesize:

Hypothesis 4 (H4): Leader inclusiveness moderates the relationship between status and psychological safety.

Engagement in quality improvement

The need for active quality improvement in health care has been widely recognized since the Institute of Medicine released its 1999 report documenting rampant failures in the health care system. Improving the quality of work processes and outcomes requires effort and engagement—which we define, drawing on Kahn (1990) as being physically, cognitively, and/or emotionally connected to the improvement work. Engagement is essential for overcoming powerful barriers to quality improvement that exist in the health care setting, as well as in other busy and chaotic service contexts. Health care professionals are often stretched thin, barely able to complete their required tasks in the workday, let alone devote time to improving the system (Tucker & Edmondson, 2003). Participating in quality improvement efforts thus requires deliberate and effortful allocation of time. Yet, despite time and resource constraints, many in health care are embracing quality improvement projects, because of what is at stake when systems fail. The construct of engagement captures the commitment and effort these individuals devote to quality improvement.

We argue that engagement in quality improvement in health care is likely to be enabled by psychological safety. First, engaging in quality improvement requires team members to be willing to try new technologies and procedures, remaining cognitively “mindful” of relationships between tasks and team members (Weick, 2002) and emotionally open to giving and receiving feedback in these states of transition. These behaviors can be interpersonally risky and thus more likely to be found when psychological safety is present. In a psychologically safe environment, team members do not feel they must be guarded in their behavior, instead feeling encouraged to question current practices and to share what may be regarded as provocative ideas, challenging the group to develop more innovative solutions. Without psychological safety, suggesting new procedures, overstepping professional status boundaries (Kahn, 1990), or offering unsolicited feedback would seem overly risky.

Second, in a related vein, researchers have argued and shown that individuals' willingness to participate in problem-solving activities diminishes significantly when they view the team as hostile (e.g., Dutton, 1993; MacDuffie, 1997). In fact, they are more likely to act in ways that diminish learning behavior (Argyris & Schön, 1978). One such way is to withdraw from the team and its work. Kahn (1990) described this as personal *disengagement*. We thus expect an association between psychological safety and engagement in quality improvement work in health care. Psychological safety creates the willingness to change personal habits (Schein & Bennis, 1965), and should allow team members to be enthusiastic about improvement and their role in that process.

Hypothesis 5 (H5): Psychological safety is positively associated with engagement in quality improvement work.

Combining Hypotheses 5 and 3, we predict that psychological safety will mediate a relationship between leader inclusiveness and engagement:

Hypothesis 6 (H6): Psychological safety mediates a relationship between leader inclusiveness and engagement in quality improvement work.

Together our hypotheses comprise a model of engagement in quality improvement work that includes antecedents and consequences of psychological safety for health care improvement teams (See Figure 1). We hypothesize that professional status (H1) and its interaction with unit team membership (H2) explain variance in psychological safety. Moreover, the magnitude of the status influence is moderated by leader inclusiveness (H4), an additional predictor of psychological safety (H3). Finally, psychological safety enables engagement in quality improvement work (H5), and mediates between leader inclusiveness and engagement (H6).

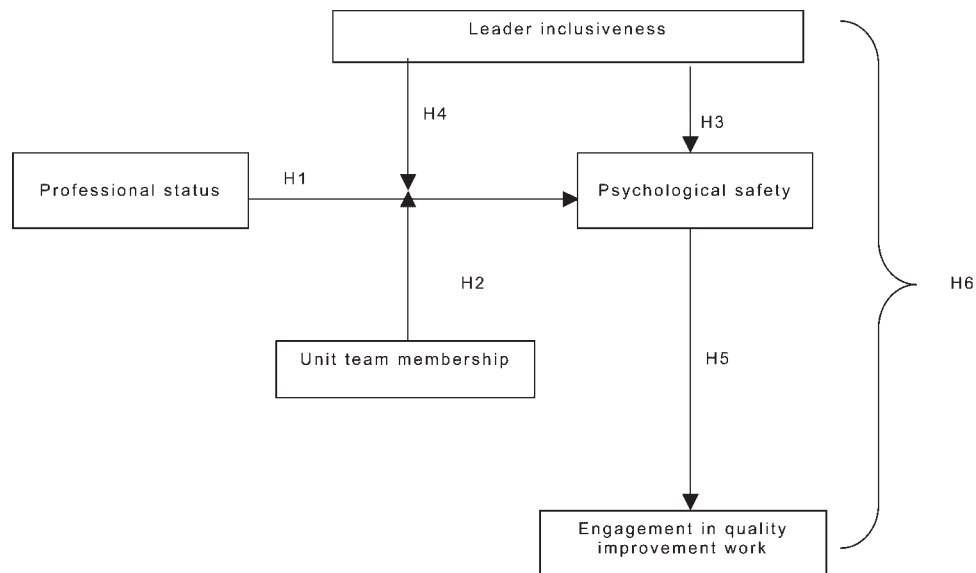


Figure 1. A model of professional status on psychological safety as a precursor to engagement in quality improvement work: the moderating effect of leader inclusiveness and the mediating effect of psychological safety

Organizational Context

The Quality Improvement Imperative in Health Care

In 1998, the National Roundtable on Health Care Quality issued a statement, *The Urgent Need to Improve Quality of Care*, which documented significant quality problems in the American health care system, problems ranging from overuse of antibiotics to underuse of beta blockers following heart attack to misuse inherent in medical error (Chassin, Galvin, & The National Roundtable on Health Care Quality, 1998). Shortly thereafter, the Institute of Medicine published *To Err is Human* (1999) and *Crossing the Quality Chasm* (2001), which further quantified the extent of preventable medical error and identified the systemic nature of quality problems. In response to these reports, health care organizations across the country from individual providers to community health centers to hospital systems bolstered their efforts to improve the quality of care they delivered (Wachter, 2004). Continuous quality improvement became a community ideal, to which every organization strove to achieve. The health care organizations we studied were no different.

Profile of Participating Unit Teams

We collected data for this study from NICUs in the United States and Canada. NICUs provide care for premature infants, infants weighing less than 1500 g and infants born with complications. All of the NICUs studied were members of the 2-year, 44-member Neonatal Intensive Care Quality Improvement Collaborative (NIC/Q 2002). Collaboratives such as this, which are intended to facilitate improvement by facilitating the transfer of knowledge across health care organizations (Kilo, 1999), are a growing phenomenon in health care (Mittman, 2004). In the one we studied, cross-disciplinary teams were encouraged to work together on specified improvement areas (e.g., infection control, respiratory care management, or discharge planning) to develop and test clinical, organizational, and operational changes for improving neonatal care. As such, this setting was particularly attractive for our study of how status relationships that exist between professional disciplines relate to psychological safety and engagement in quality improvement in cross-disciplinary teams. To craft and execute their quality improvement projects in-house, team members from different disciplines had to work together. Development of a new or better delivery room plan for infant resuscitation, for example, required physicians, nurses, and respiratory therapists to share their expertise and recommendations with one another to ensure that the developed plan included accurate and up-to-date practices from each group, and accounted for their interactions.

Methods

Sample and procedure

We conducted data collection in three phases. First, we visited 4 of the 44 neonatal intensive care units (NICUs) in the collaborative. We toured the units, observed unit functioning and interviewed

23 staff members (5–7 members per NICU) for 30 to 90 minutes using open-ended questions about the NICU work climate and quality improvement efforts. We selected the four NICUs to include differences in demographic variables (e.g., teaching status, size, etc.) and improvement efforts (e.g., improvement focus areas and prior collaborative participation) and selected interviewees to capture multiple professional groups (i.e., physicians, nurses, and respiratory therapists). This increased our understanding of NICUs and facilitated the design of a meaningful survey for this population. In the second phase, we developed and pilot tested a survey with these four NICUs. Descriptive statistics and psychometric tests indicated no need to alter the survey. Further, the survey results accorded with our site visit observations, supporting the validity of the instrument.

In the third and final phase, we invited the 40 remaining, non-pilot site NICUs in the collaborative to participate in the survey via phone and electronic mail directed to the leader of each NICU's collaborative improvement team. Twenty-three NICUs agreed, for a NICU response rate of 58%. When we compared participating sites to non-participating sites, we found no significant differences between the two groups on a variety of structural, clinical, and patient acuity measures. For example, there were no significant differences based on hospital ownership type (not-for-profit, for-profit, government), teaching status, level of severity of the care provided in the NICU, volume of extremely low birth weight babies (ELBW, less than or equal to 1000 g), number of times the site participated in prior collaboratives (0, 1, or 2), length of stay, percentage of ELBW babies with Apgar scores ≤ 3 one minute after birth, percentage of babies transported from another hospital ("outborn"), average birth weight, and gestational age (see Tucker, Nembhard, & Edmondson, 2006).

As soon as a NICU received the permission of its hospital Institutional Review Board (IRB), its team leader provided us with a count of the number of staff and patient beds in the unit. We then invited all team members in the NICU to participate in our survey via an invitational letter distributed in accordance with the procedures outlined in the hospital IRB approval. In 18 NICUs, the collaborative team leader electronically mailed or placed in team mailboxes our letter to team members, which provided instructions on where to retrieve a paper copy of the survey in the unit, if interested. In the remaining five NICUs, the team leader distributed our letter along with a paper copy of the survey to team mailboxes. The invitational letter described the purpose of the study, assured respondents' anonymity and included instructions for completion of the paper as well as an online version of the survey. We offered two versions to allow participants to choose their preferred format. All individuals returned the survey directly to us via self-addressed stamped envelope or online submission.

In all, 1440 health care professionals (46% of team members contacted) from 23 NICUs in the United States and Canada completed the survey between July 2003 and May 2004. Of the respondents, 1375 persons declared their profession: 100 as physicians (83 neonatologists, 13 attending physicians, and 4 neonatology fellows), 998 as nurses (65 neonatal nurse practitioners, 16 Master's prepared nurses, 8 clinical nurses specialists, 867 registered nurses, 14 licensed nurse practitioners, and 28 other nursing functions), 131 as respiratory therapists, and 146 as other types of health care professionals (e.g., social worker, dietitians, etc.). Excluding individuals in the latter group (because the presence and recognition of their discipline as part of the NICU team varied across units), NICUs averaged 60 respondents, ranging from 10 to 164. The average number of respondents per NICU was 3 physicians, 15 nurses, and 5 respiratory therapists.

We regarded the professionals in each NICU from medicine, nursing, and respiratory therapy as the "unit team" because these interdependent professionals unquestionably work together in the unit on a daily basis. Their patients generally stay in the NICU for an extended period of time, often months, to

receive the care that only a team of neonatal-trained practitioners can deliver. These teams and members are so specialized that they work exclusively in the NICU.²

Measures

Professional status

Professional status was inferred from occupational category because prior research had demonstrated that status in the medical field derives from role or position in the professional hierarchy (Friedson, 1970a,b, 1994; Mechanic, 1991; Wolinsky, 1988). The numerous professional roles reported in the survey were combined into three major categories for the purposes of these analyses: (1) physicians (neonatologists, other attending physicians and neonatal fellows); (2) nurses; and (3) respiratory therapists. Further, because physicians—as “captains of the health care team” (Fuchs, 1974)—garner higher status than all other health care professionals (Hafferty & Light, 1995), an additional dichotomous professional status variable was created to reflect that (0 = low-status = nurses and respiratory therapists, 1 = high status = physicians).

Unit team membership

Unit team membership, a categorical variable, refers to the specific NICU in which an individual respondent worked ($N = 23$).

Psychological safety

Four items from Edmondson’s (1999) psychological safety scale adapted to this context were used to assess the extent to which respondents felt safe to speak up about issues or ideas regarding the NICU. Examples of these items are: “Members of this NICU are able to bring up problems and tough issues” and “People in this unit are comfortable checking with each other if they have questions about the right way to do something.” Respondents’ agreement (1 = strongly disagree, 7 = strongly agree) with these items formed a single scale (Chronbach alpha = 0.73).

Leader inclusiveness

In the hospital context, physicians are both high-status technical experts and leaders who are responsible for directing the efforts of others in delivering care to patients. Thus, although the construct of leader inclusiveness is more general, in this setting, it refers to behaviors and attitudes of the physicians-in-charge. A three-item scale assessed the extent to which NICU leaders’ words and deeds indicated an invitation and appreciation for others as contributing members in a team endeavor. The first two items, “NICU physician leadership encourages nurses to take initiative” and “Physicians ask for the input of team members that belong to other professional groups,” were adapted from Shortell et al.’s (1991) physician leadership scale. The third item, “Physicians do not value the opinion of others equally” (reversed scored), was developed by us for this research. The level of agreement with each statement (1 = strongly disagree, 7 = strong agree) was averaged to provide a single perception for each respondent (Chronbach alpha = 0.75).

In this study, we assessed leader inclusiveness with data from non-physicians only, for two reasons. First, prior research suggested that nurses provide a more accurate assessment of organizational culture

²There is one possible exception to the exclusivity of the NICU teams. Some hospitals do use “rotating” respiratory therapists, who work exclusively on the unit for a defined period of time periodically (e.g., 2 months every 2 months), then rotate to other units when not assigned to the NICU. That said, we believe that “unit teams” are accurately represented in our sample since we asked team leaders to distribute the survey to NICU staff. We abided by team leader judgment of team membership.

and leadership practices than physicians. One study showed that while nurses' reports of the culture showed appropriate variance, physicians' reports were more uniform across different contexts, as well as more positive; further, only the nurse data predicted performance outcomes (Leonard, Frankel, Simmonds, & Vega, 2004), affirming earlier studies' findings that nurses' perceptions of the work environment are more predictive of the risk of adverse outcomes (e.g., Baggs et al., 1999) and quality of care (e.g., Shortell et al., 1991) than physicians. Second, and more important, conceptually, those with low status are in a better position to assess the degree to which high-status leaders are including them than are those with high status—who may rate themselves as inclusive even when others would not do so. More simply, physician ratings of their own inclusiveness toward others are unlikely to be as externally valid as the ratings of those others will be.

Engagement in quality improvement work

Engagement in quality improvement work was measured using a four-item scale adapted from Baker, King, MacDonald, & Horbar (2003). Sample items are: "A growing number of staff in this NICU are participating in improvement efforts" and "In the coming year, I would like to be very involved in our NICU's quality improvement efforts." Respondents rated their agreement with these statements on a seven-point scale (1 = strongly disagree to 7 = strongly agree). Chronbach's alpha was 0.79.

Control variables

We included gender, years working in any NICU, years as an employee of the hospital, years working in the current NICU, and hours per week in the NICU as control variables since these demographic variables are potential predictors of psychological safety at the individual level. These control variables were excluded from the group-level analyses performed to test psychological safety as a mediator between leader inclusiveness and engagement in quality improvement work (H6).

Table 1 provides the means, standard deviations, and intercorrelations between the variables. We assessed the adequacy of our survey measures through tests of internal consistency reliability and discriminant validity. The results supported the use of these measures for analysis. Chronbach's alpha for all survey scales exceeded the 0.70 threshold proposed by Nunnally (1978) for internal consistency, and factor analysis, in which the planned constructs emerged, confirmed discriminant validity.

Analysis and Results

To test Hypotheses 1 and 2, that status and its interaction with unit team membership explain variance in psychological safety; we used a univariate general linear model (GLM) with professional status (three groups: physicians, nurses, and respiratory therapists) and unit team membership as independent variables and the reflected, logarithmic transformation of psychological safety as the dependent variable.³ We also included the above mentioned control variables. Results shown in the upper portion of Table 2 indicate that two of the five control variables were significant and that our first two hypotheses were supported. The number of years spent working in any NICU and the number of years

³The reflected, logarithmic transformation corrected for heterogeneity of variance and non-normality (i.e., negative skewness) in the dataset (Tabachnick & Fidell, 2001).

Table 1. Summary statistics and intercorrelations for individual-level data

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1. Professional status—3 groups: Physicians versus nurses versus therapists	2.03	0.43									
2. Professional status—2 groups: High versus low status	0.08	0.27	0.71**								
3. Psychological safety	5.31	1.08	0.15**	0.14**							
4. Leader inclusiveness	4.62	0.55	<0.01	-0.01	0.29**						
5. Engagement in quality improvement work	5.45	1.06	0.12**	0.17**	0.48**	0.21**					
6. Gender	1.10	0.30	0.23**	0.56**	0.05	-0.04	0.02				
7. Years in any NICU [§]	4.17	1.19	0.08**	0.10**	-0.05	0.09**	-0.03	0.08**			
8. Years as hospital employee [§]	3.97	1.26	0.03	0.01	-0.04	0.02	-0.02	0.07*	0.73**		
9. Years in current NICU [§]	3.84	1.31	0.05	0.03	-0.04	0.02	-0.02	0.08**	0.81**	0.94**	
10. Hours per week in NICU	33.84	13.46	0.35**	0.38**	0.05	-0.03	0.10**	0.12**	-0.06	-0.08**	-0.08**

[§]This is a categorical variable: 1 = less than 1 year, 2 = 1 to less than 2 years, 3 = 2 to less than 5 years, 4 = 5 to less than 10 years, 5 = 10 or more years.

* $p < 0.05$.

** $p < 0.01$.

Table 2. Results of general linear model analysis

Model	Independent variables	F-ratio	p
Y = Ln(Psychological safety)	Gender	$F(1,1111) = 0.01$	0.93
	Years in any NICU	$F(4,1111) = 3.54$	0.01
	Years as a hospital employee	$F(4,1111) = 2.09$	0.08
	Years in current NICU	$F(4,1111) = 3.09$	0.02
	Hours per week in NICU	$F(1,1111) = 0.24$	0.62
	Professional status—three groups	$F(2,67) = 8.46$	0.001
	Unit team membership	$F(22,41) = 2.08$	0.02
	Professional status (3) × unit team membership	$F(31,1111) = 2.22$	<0.001
Y = Ln(Psychological safety)	Gender	$F(1,1126) = 0.10$	0.76
	Years in any NICU	$F(4,1126) = 3.98$	0.003
	Years as a hospital employee	$F(4,1126) = 1.66$	0.16
	Years in current NICU	$F(4,1126) = 2.43$	0.05
	Hours per week in NICU	$F(1,1126) = 0.001$	0.97
	Professional status—two groups	$F(1,1126) = 11.58$	0.001
	Leader inclusiveness	$F(21,1126) = 4.27$	<0.001
	Professional status (2) × leader inclusiveness	$F(18,1126) = 1.78$	0.02

spent working in the current NICU significantly predicted psychological safety ($F(4,1111) = 3.54$, $p = 0.01$ and $F(4,1111) = 3.09$, $p = 0.02$): More time spent in NICUs in general as well as an intermediate amount of time spent in the current NICU (5 to less than 10 years) both were associated with higher psychological safety. The number of years as an employee of the current hospital was only marginally predictive ($F(4,1111) = 2.09$, $p = 0.08$), and gender and hours worked per week not at all ($F(1,1111) = 0.01$, $p = 0.93$ and $F(1, 1111) = 0.24$, $p = 0.62$).

Consistent with Hypothesis 1, professional status was positively associated with psychological safety ($F(2,67) = 8.46$; $p = 0.001$). Physicians felt significantly more psychological safety than nurses ($t(1111) = -0.33$, $p < 0.001$) who in turn reported more psychological safety than respiratory therapists ($t(1111) = -0.11$, $p = 0.02$); the overall planned contrast was significant ($F(2, 1111) = 14.11$, $p < 0.001$).

To determine whether the effect of professional status on psychological safety varied across multidisciplinary teams, as predicted in Hypothesis 2, we examined the interaction term composed of professional status and unit team membership. The interaction was significant ($F(31,1111) = 2.22$, $p < 0.001$), indicating that the difference in psychological safety felt across status groups varied across teams, even as the main effect of status on psychological safety remained significant. In some teams, status differences were less important, such that members of different professional groups felt similarly safe. In others, professional status differences led to larger disparities in psychological safety among groups.

Hypotheses 3 and 4 that leader inclusiveness predicts psychological safety, and moderates the relationship between status and psychological safety, were tested using GLM analyses. First, however, we assessed the properties of leader inclusiveness, as a new construct. Just as prior work (Edmondson, 1999; Shamir, Zakay, Breinin, & Popper, 1998) has shown convergent perceptions of leadership behavior in teams, we anticipated that views of leader inclusiveness would be shared in the NICUs studied. To test this, we performed a one-way analysis of variance with unit team membership as the independent variable and leader inclusiveness (rated by non-physicians only) as the dependent variable. The ANOVA results showed significant variance at the group level of analysis for leader inclusiveness as reported by low-status individuals ($F(22,1095) = 9.44$, $p < 0.001$), and an intraclass correlation that

was positive and significant ($r_{\text{ICC}} = 0.35$), confirming leader inclusiveness as a group-level measure (Kenny & LaVoie, 1985). We therefore entered the team's leader inclusiveness score (the team average) as the individual's score for each member of the team in the individual-level dataset.

We used this dataset and a GLM to test Hypotheses 3 and 4 that leader inclusiveness is positively associated with psychological safety and moderates the relationship between professional status and psychological safety. The dichotomous professional status variable (high status, if physician and low status, if nurse or respiratory therapist), leader inclusiveness, and their interaction served as independent variables, along with all of the control variables. Again, the reflected, logarithmically transformed psychological safety measure served as the dependent variable. The results shown in the lower section of Table 2 support the hypothesized relationships. When physician leaders were perceived as inclusive and welcoming of others' ideas and efforts, psychological safety was greater ($F(21, 1126) = 4.27, p < 0.001$) (Hypothesis 3). Also, as predicted in Hypothesis 4, leader inclusiveness moderated the relationship between status and psychological safety, as indicated by a significant interaction term ($F(18, 1126) = 1.78, p = 0.02$). Low leader inclusiveness was associated with a greater disparity in psychological safety between high and low-status individuals to the disadvantage of low-status individuals. In contrast, high leader inclusiveness was associated with a lower difference in psychological safety between the two groups, raising the psychological safety of low-status individuals closer to that of their high-status team members. (See Figure 2).

To test Hypothesis 5 that psychological safety is positively associated with engagement in quality improvement work, we conducted a regression analysis on the group level dataset. Using this dataset, allowed us to not only test our hypothesis, but also as important, examine the relative influence of a competing group-level variable on engagement: staff workload or busyness of the work environment. Prior work has identified staff workload as a predictor of quality-related behavior (Oliva, 2001; Tucker & Edmondson, 2003). Overburdened employees facing competing priorities are less likely to further quality goals. Therefore, to continue with our model of engagement in quality improvement

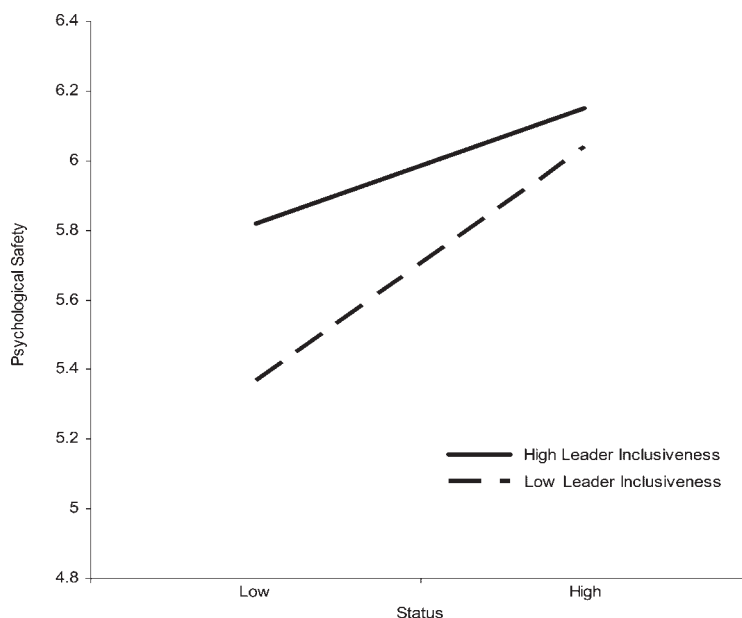


Figure 2. Psychological safety as a function of professional status and leader inclusiveness

work, the question of relative influence had to be addressed to provide assurance that our model was not mis-specified in emphasizing psychological safety as a determinant of engagement. We first performed one-way analysis of variance and intraclass correlations for psychological safety ($F(22, 1366) = 8.62$, $p < 0.001$; $r_{\text{ICC}} = 0.21$) and engagement in quality improvement work ($F(22, 1352) = 7.67$, $p < 0.001$; $r_{\text{ICC}} = 0.18$) to confirm the group level status of the variables before proceeding with the analysis. We then regressed engagement on psychological safety and the ratio of staff-to-patient beds, (mean = 3.31, SD = 0.91), our measure of staff workload. The results provided support for our hypothesis that the more members feel they work in a team characterized by interpersonal trust and respect, the more enthusiastic and devoted they are to participating in quality improvement efforts, which often require the interpersonally risky act of collaborative learning ($B = 0.62$, $p = 0.001$). We found this relationship, even after accounting for the competing influence of staff busyness, which was an insignificant predictor of engagement ($B = -0.14$, $p = 0.09$) and thus eliminated from further analyses.

To test Hypothesis 6, that psychological safety mediates the relationship between leader inclusiveness and engagement in quality improvement work, we estimated three regression equations to satisfy the conditions for mediation (Baron & Kenny, 1986). The first condition is that the independent variable must significantly affect the mediator; second, the independent variable must predict the dependent variable; and third, the mediator must significantly predict the dependent variable when entered in the same regression equation as the independent variable, while the independent variable drops in significance or becomes insignificant. We assessed whether these conditions were satisfied using group-level data because leader inclusiveness (our independent variable), psychological safety (our proposed mediator), and engagement in quality improvement work (our dependent variable) are conceptually meaningful and empirically demonstrated as group-level variables. We measured leader inclusiveness at the aggregate non-physician level for reasons explained above, and analyses related to testing Hypothesis 5 confirmed psychological safety and engagement as group-level constructs as well.

As shown in Table 3, the results support all three mediation conditions: (1) leader inclusiveness predicts psychological safety ($B = 0.53$, $p < 0.001$), (2) leadership inclusiveness predicts team engagement at the group level ($B = 0.41$, $p = 0.004$), and (3) when included in the same model, leader inclusiveness becomes insignificant ($B = 0.11$, $p = 0.52$), while psychological safety remains significant ($B = 0.57$, $p = 0.03$). Thus, the data support psychological safety as a mediator of the relationship between leader inclusiveness and team engagement in quality improvement work.

In sum, all of our hypotheses were supported by the data. Not only do high-status individuals differ from low-status individuals in psychological safety, but also there is an interaction between status and unit team membership, and between status and leader inclusiveness. Greater inclusiveness minimizes the effect of status on psychological safety in the team, and vice versa. Moreover, with more leader

Table 3. Tests of psychological safety as a mediator between leader inclusiveness and engagement in quality improvement work ($N = 23$)

Conditions to demonstrate mediation*	Independent variable	B	t	p	R ²
1. Does leader inclusiveness predict <i>engagement in quality improvement work</i> ?	Leader inclusiveness	0.41	3.19	0.004	0.33
2. Does leader inclusiveness predict <i>psychological safety</i> ?	Leader inclusiveness	0.53	5.02	<0.001	0.55
3. Does the effect of leader inclusiveness drop substantially or become insignificant when psychological safety (the mediator) is included in the model for <i>engagement in quality improvement work</i> ?	Psychological safety	0.57	2.32	0.03	0.47
	Leader inclusiveness	0.11	0.65	0.52	

*Dependent variables are in italics.

inclusiveness comes greater psychological safety, which in turn predicts greater team engagement in quality improvement work.

Discussion and Conclusions

Toward a theory of role-based status and psychological safety in teams

This paper empirically examined the effect of professional status on psychological safety in health care teams, motivated both by the theoretical role of psychological safety in team learning (Edmondson, 1999) and by the practical need for team learning in today's hospitals. As anticipated, psychological safety was significantly associated with professional status in these data. The results thus suggest that, in health care, professional status influences beliefs about how easy or appropriate it is to speak up to offer ideas, raise concerns, or ask questions. At the same time, our results showed significant differences across groups in the strength of the association between status and psychological safety, suggesting that this relationship need not be deterministic. In some teams, members with high (i.e., physicians) and low (i.e., nurses and respiratory therapists) status reported more similar levels of safety than in other teams, in which relatively large disparities in psychological safety between professional groups were found. This finding provides reassurance that the effects of traditional status differences in health care may be overcome, facilitating full participation in cross-disciplinary team improvement efforts.

Unlike in other industries, where employees may advance in the hierarchy—moving from sales assistant to sales associate or from analyst to consultant to principal, for example—medical professionals cannot rely on professional mobility to confer greater status. Professions tend to be stable over a career. Nurses and respiratory therapists generally do not become doctors. As a result, the opportunity for natural status gains by lower status individuals can be rare. With history and industry structure as perpetuators, profession-related status differences continue. And, the growing interdependence among professions only heightens intergroup tensions. According to social psychological (Alderfer, 1977; Alderfer & Smith, 1982; Messick & Mackie, 1989) and ethnographic (Dougherty, 1992) research, this is natural.

Our results suggest leader inclusiveness—words and deeds by leaders that invite and appreciate others' contributions—can take nature off its course, helping to overcome status' inhibiting effects on psychological safety. In cross-disciplinary teams with high leader inclusiveness, the status–psychological safety relationship was weakened. We thus suggest that active, inclusive behavior on the part of physician leaders may be an essential means of facilitating others' meaningful engagement in team-based quality improvement work. Thus, a key contribution of this study is the identification of an interpersonal strategy for improving the climate for learning within cross-disciplinary teams in health care. This extends prior work that has shown psychological safety consistently to be related to leader behavior (Edmondson, 1999, 2003; Hult, Hurley, Guinipero, & Nichols, 2000; Lovelace, Shapiro, & Weingart, 2001; Norrgren & Schaller, 1999), by narrowing and sharpening the nature of leader behaviors that promote psychological safety.

Recent studies of psychological safety and communication in the health care environment have also highlighted the role of the leadership in cultivating a culture of safety, but have not articulated the actual practices of leaders that are needed, other than *training staff* to speak

up (Leonard et al., 2004; Maxfield, Grenny, McMillan, Patterson, & Switzler, 2005). Our research suggests that *training leaders* to invite team members' comments and to appreciate those comments overtly is as important. As we did not test any training methods, we cannot draw conclusions about what training strategies will work. However, training that includes instruction in the timing and phrasing of invitation and appreciation may be useful. Boyle and Kochinda (2004) tested a training intervention to improve communication between nurse and physician leaders,⁴ and found that staff perceptions of leadership, communication, and problem-solving between professional groups improved in the post-intervention period, affirming that leadership training is a promising route to improved team climate. Our results also suggest it is a route to increasing engagement in quality improvement.

A more nuanced look at team learning for health care improvement efforts

The study also provides insight into a more focused type of team learning than has been investigated in prior-related research: team learning for quality improvement. First, we found evidence that psychological safety, in combination with leader inclusiveness, promotes team engagement in quality improvement work. Second, the finding that psychological safety mediates between leader inclusiveness and engagement in quality improvement extends prior work that showed psychological safety to be a mediator between the broader construct of team leader coaching behavior and team learning behavior, more generally (Edmondson, 1999). Finally, our model and findings shed light on the important but rarely studied phenomenon of engagement in discretionary, effortful quality improvement activities. Although our emphasis was on the effects of psychological safety, we also acknowledge that there may be other processes that contribute to engagement (e.g., psychological availability (Kahn, 1990)) that we have not addressed. Future research should explore additional mechanisms by which teams become actively engaged in quality improvement work.

The challenge of engaging busy, overworked professionals and service workers—already burdened by the heavy demands of their “real jobs”—in quality improvement activities should not be underestimated. In the course of a day, health care professionals are continuously called upon to immediately address the many needs of patients and co-workers. The requests are so many that nurses often sacrifice their personal breaks (e.g., lunchtime) and work overtime without compensation in order to complete their daily clinical care tasks (Tucker & Edmondson, 2003). The time pressure to complete tasks is so great that the most burdened frequently neglect to wash their hands, despite almost universal awareness that hand hygiene is a cornerstone of good clinical practice (Institute of Medicine, 2003).

In this challenging work environment, competing demands could surely relegate the perceived extra-role work of participating in quality improvement efforts to the background unless engagement ignites a counter response. Our analyses—using staff-to-patient beds as a measure of workload—suggest that the engagement needed to motivate such efforts is related more to psychological safety within the unit team than the burden created by competing demands and workload. This is good news for health care because it suggests that improvement efforts need not be delayed until greater slack is created; rather engagement in improvement efforts may occur in unit teams once a climate of psychological safety for

⁴The “collaborative communication intervention” employed by Boyle & Kochinda (2004) consisted of multiple learning activities, small group skill practice and problem solving decisions; feedback and reinforcement of newly learned skills; a planning assignment for on-the-job applications; and assessment and feedback after the intervention. Participating ICU leaders spent a total of 23.5 hours learning communication and process skills (e.g., how to open a conversation, how to seek ideas from all involved, etc.).

learning is cultivated. Thus, another contribution of the present study is to illuminate organizational antecedents of engagement, which can be a difficult state to elicit naturally.

Limitations

This study is not without limitations. First, our use of a sample consisting exclusively of NICUs and their professionals may limit the generalizability of the findings. While NICUs are similar to other health care units in exemplifying the trend toward cross-disciplinary teams mentioned at the outset (associated with increasing knowledge, specialization, and interdependence), one could argue that these trends are heightened in NICUs, making the setting unusual. Moreover, the fragility of the (infant) patient and the importance of timely communication and action are also special characteristics of the NICU. These contextual variables may foster an appreciation for teamwork and recognition of each discipline's contribution such that leader inclusiveness is more prevalent in NICUs than in other health care settings, and more likely to elicit responsiveness. Other unit types (e.g., outpatient units) may be slower to realize the unique contributions of traditionally lower status team members and the interdependency among disciplines. Therefore, status differences may be greater in those unit teams compared to those in the NICU environment, and leadership's achievement of inclusiveness may be more difficult. Our data do not allow us to make a comparison based on unit type. However, the presence of significant variance between NICUs with respect to leader inclusiveness suggests that leader inclusiveness is not a universal NICU attribute. Some NICU leaders experience significant difficulty behaving inclusively. Whether this relationship varies across unit types will have to be investigated in future work.

Future work should also address imperfections of our data. We received completed surveys from only 58% of the NICUs in the collaborative and only 46% of unit team members contacted (excluding survey pilot sites). Although demographic comparison of participating and non-participating NICUs showed no differences between the two groups and our response rates are similar to other studies in hospitals (Edmondson, 1996; Kaissi, Kralewski, Curoe, Dowd, & Silversmith, 2004; Jacob & Deshpande, 1997), we cannot ignore the possibility of non-response bias at the group and individual levels. The latter is a most serious concern if individual non-respondents are those who did not feel psychologically safe and included. The absence of their responses biases their unit data upward, incorrectly giving the appearance of units that have managed to minimize status differences in psychological safety and that are inclusive. Subsequent studies with higher response rates are needed to address this concern. Additionally, those studies are advised to examine a relationship we were unable to test with our dataset—whether specialization among nurses is associated with differences in psychological safety. Nurse respondents did indicate their professional training (e.g., neonatal nurse practitioner vs. Master's prepared nurse) in their survey responses; however this was not enough information to accurately identify different specialties within the nursing populations across units. We urge scholars in this area to collect information about daily tasks and specific care delivery roles to further assess the effects of specialization and status *within* a professional group on psychological safety.

Finally, we must acknowledge that team engagement in quality improvement work is an intermediary outcome. The ultimate goal of health professionals involved in quality improvement work is to close the gap between current and evidence-based practice to produce the highest quality care possible in a consistent manner (Shojania, McDonald, Wachter, & Owens, 2004). Although we lack data in this study to test the relationship between engagement in quality improvement work and team learning as evidenced by quality improvement outcomes, past research shows a positive relationship between employee engagement and other organizational outcomes, including customer satisfaction,

productivity, profit, and safety (Buckingham & Coffman, 1999), and future research should further test this relationship.

Practical implications

In sum, this study extends a stream of research on creating psychological safety for learning within cross-disciplinary teams, and begins the discussion about team engagement in quality improvement work. At a time when much attention is centered on how to advance quality improvement efforts in health care, this paper offers initial theoretical and practical insight. Specifically, training leaders to be inclusive to foster psychological safety may be a critical antecedent of effective quality improvement, because it may create the engagement that is necessary for teams to participate in the specific learning activities required for quality improvement. We find, in related work, that psychological safety enables the performance of “learn-how” activities—experimental activities such as pilot projects, dry runs, and problem-solving cycles—which are interpersonally risky yet often required for the implementation success of quality improvement projects in health care (Tucker et al., 2006). Together, these findings imply a focus on team leader behavior to create the conditions (i.e., psychological safety) and then the opportunities (i.e., learn-how activities) for team quality improvement efforts.

We do not intend to suggest that the development of inclusive leaders within NICUs would affect psychological safety or engagement in other parts of hospital systems. NICU leaders rarely interact with other clinical units, thus the opportunities for their inclusive nature to shape the climate of other multidisciplinary care delivery teams directly is limited. Likewise, NICU team members typically do not work on other care teams, so any habit of collaborative interactions is mostly NICU-contained.

Although this research took place in the health care context, the findings may apply to other organizational contexts as well. In particular, in other organizations with cross-disciplinary teams, status diversity and a need for teams to continuously improve the services or products the organization produces, the model developed in this paper may be highly relevant. A growing number of industries are characterized by these features, as organizations realize that individuals in different functions, locations, and stations of life possess specialized knowledge that can be valuable for problem-solving and innovation, *if* shared and combined with the knowledge of other employees through teamwork. Therefore, our model may have wider relevance than just health care, but health care, with its prevalence of cross-disciplinary teams, salient status differences, and many quality improvement efforts is particularly conducive for exploring and developing these ideas.

Acknowledgements

This research benefited greatly from the expert help of health care management and operations researchers Anita L. Tucker and Dr. Richard Bohmer (also a physician), as well as the superb research assistance of Laura Feldman. We thank the participants in the Leadership and Groups seminar at Harvard University, Denise Rousseau and two anonymous reviewers for constructive comments on earlier versions of this manuscript. We also appreciate the invitation to conduct this research provided by Dr. Jeffrey Horbar, Kathy Leahy, Paul Plsek and the Vermont Oxford Network, as well as the willingness of nurses, physicians, respiratory therapists and other staff members of the participating

hospitals to engage in this research. Their time, effort, and honesty provided an invaluable contribution, for which we are deeply appreciative. The Harvard Business School Division of Research provided financial support.

Author biographies

Ingrid M. Nembhard is a doctoral candidate in the Ph.D. Program in Health Policy (Management Concentration) at Harvard University. She received her S.M. in Health Policy and Management from the Harvard School of Public Health. Her research interests include intra- and inter-organizational learning, collaborative teams, and quality improvement in health care.

Amy C. Edmondson is Novartis Professor of Leadership and Management at Harvard University. She received her A.M. in Psychology and Ph.D. in Organizational Behavior from Harvard. Her research focuses on understanding and improving processes through which organizations learn and innovate, in health care and other industry settings.

References

- Accreditation Council for Graduate Medical Education. (2004). *2002–2003 Annual Report*. Retrieved December 14, 2004, from http://www.acgme.org/acWebsite/about/ab_2002-03AnnRep.pdf.
- Aiken, L. H., & Sloane, D. M. (1997). Effects of specialization and client differentiation on the status of nurses: The case of AIDS. *Journal of Health and Social Behavior*, *38*, 203–222.
- Alderfer, C. P. (1977). Group and intergroup relations. In J. R. Hackman, & J. L. Suttle (Eds.), *Improving life at work: Behavioral science approaches to organizational change* (pp. 227–296). Santa Monica, CA: Goodyear.
- Alderfer, C. P. (1987). An intergroup perspective on organizational behavior. In J. W. Lorsch (Ed.), *Handbook of organizational behavior* (pp.190–222). Englewood Cliffs, NJ: Prentice-Hall.
- Alderfer, C. P., & Smith, K. K. (1982). Studying intergroup relations embedded in organizations. *Administrative Science Quarterly*, *27*, 35–65.
- Anderson, C., John, O. P., Keltner, D., & Kring, A. M. (2001). Who attains social status? Effects of personality and physical attractiveness in social groups. *Journal of Personality and Social Psychology*, *81*, 116–132.
- Argyris, C. (1985). *Strategy, change, and defensive routines*. Boston, MA: Pitman.
- Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.
- Ashford, S. J., Rothbard, N. P., Piderit, S. K., & Dutton, J. E. (1998). Out on a limb: The role of context and impression management in selling gender-equity issues. *Administrative Science Quarterly*, *43*, 23–57.
- Bacharach, S. B., Bamberger, P., & Mundell, B. (1993). Status inconsistency in organizations: From social hierarchy to stress. *Journal of Organizational Behavior*, *14*, 21–36.
- Baggs, J. G., Schmitt, M. H., Mushlin, A. I., Mitchell, P. H., Eldredge, D. H., & Oakes, D., et al. (1999). Association between nurse-physician collaboration and patient outcomes in three intensive care units. *Critical Care Medicine*, *27*, 1991–1998.
- Baker, R. G., King, H., MacDonald, J. L., & Horbar, J. D. (2003). Using organizational assessment surveys for improvement in neonatal intensive care. *Pediatrics*, *111*, e419–e425.
- Baker, R. G., Murray, M., & Tasa, K. (1995, December). *Quality in action: An instrument for assessing organizational culture for quality improvement*. Paper presented at the First International Scientific Symposium on Improving Quality and Value in Health Care, Orlando, FL.
- Baron, R.A. (1990). Countering the effects of destructive criticism: The relative efficacy of four interventions. *Journal of Applied Psychology*, *73*, 199–207.

- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1183.
- Bass, B. M. (1990). *Bass and Stogdill's handbook of leadership*. New York: Free Press.
- Benoit-Smullyan, E. (1944). Status, status types, and status interrelations. *American Sociological Review*, *9*, 151–161.
- Berger, J., Cohen, B. P., & Zelditch, M. (1972). Status characteristics and social interaction. *American Sociological Review*, *8*, 241–255.
- Berger, J., Fisek, H., Norman, R. Z., & Zelditch, M. (1985). The formation of reward expectations in status situations. In J. Berger, & M. Zelditch (Eds.), *Status, rewards, and influence*. San Francisco, CA: Jossey-Bass.
- Berger, J., Rosenholtz, S. J., & Zelditch, M. (1980). Status organizing processes. In A. Inkeles, N. J. Smelser, & R. H. Turner (Eds.), *Annual review of sociology* (Vol. 6, pp. 479–508). Palo Alto: Annual Reviews.
- Berwick, D. M., Godfrey, A. B., & Roessner, J. (1990). *Curing health care: New strategies for quality improvement: A report on the National Demonstration Project on Quality Improvement in Health Care*. San Francisco, CA: Jossey-Bass.
- Boyle, D. K., & Kochinda, C. (2004). Enhancing collaborative communication of nurse and physician leadership in two intensive care units. *Journal of Nursing Administration*, *34*, 60–70.
- Brown, P., & Levinson, S. C. (1987). *Politeness: Some universals in language usage*. New York: Cambridge University Press.
- Brown, M. S., Ohlinger, J., Rusk, C., Delmore, P., & Ittmann, P., on behalf of the CARE Group. (2003). Implementing potentially better practices for multidisciplinary team building: Creating a neonatal intensive care unit culture of collaboration. *Pediatrics*, *111* (Supplement), e482–e488.
- Buckingham, M., & Coffman, C. (1999). *First, break all the rules*. New York: Simon and Schuster.
- Bunderson, J. S. (2003a). Recognizing and utilizing expertise in work groups: A status characteristics perspective. *Administrative Science Quarterly*, *48*, 557–591.
- Bunderson, J. S. (2003b). Team member functional background and involvement in management teams: Direct effects and the moderating role of power centralization. *Academy of Management Journal*, *46*, 458–474.
- Chassin, M. R. (1998). Is health care ready for six sigma quality? *Milbank Quarterly*, *76*, 575–591.
- Chassin, M. R., Galvin, R. W., & The National Roundtable on Health Care Quality. (1998). The urgent need to improve health care quality. *Journal of the American Medical Association*, *280*, 1000–1005.
- Coburn, D. (1992). Friedson then and now: An 'internalist' critique of Friedson's past and present views of the medical profession. *International Journal of Health Services*, *22*, 497–512.
- DeSantis, G. (1980). Realms of expertise: A view from within the medical profession. In J. A. Roth (Ed.), *Research in the sociology of health* (pp.179–236). Greenwich, CT: JAI.
- Detert, J. R., & Edmondson, A. C. (2005). No exit, no voice: The bind of risky voice opportunities in organizations. *Harvard Business School Working Paper*, 05–049.
- Dingwall, R. W. (1974). Some sociological aspects of 'nursing research'. *The Sociological Review*, *22*, 45–55.
- Donaldson, M. S., & Mohr, J. J. (2000). *Exploring innovation and quality improvement in health care microsystems: A cross case analysis*. Washington, DC: Institute of Medicine, National Academy Press.
- Dougherty, D. (1992). Interpretive barriers to successful product innovation in large firms. *Organization Science*, *3*, 179–202.
- Driskell, J. E., & Salas, E. (1991). Group decision making under stress. *Journal of Applied Psychology*, *76*, 473–478.
- Dutton, J. E. (1993). The making of organizational opportunities: An interpretive pathway to organizational change. In L. L. Cummings, & B. M. Staw (Eds.), *Research in organizational behavior* (pp. 195–226). Greenwich, CT: JAI Press.
- Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*, 350–383.
- Edmondson, A. C. (1996). Learning from mistakes is easier said than done: Group and organizational influences on the detection and correction of human error. *Journal of Applied Behavioral Science*, *32*, 5–32.
- Edmondson, A. C. (2003). Speaking up in operating room: How team leaders promote learn interdisciplinary action teams. *Journal of Management Studies*, *40*, 1419–1452.
- Edmondson, A. C., Roberto, M. A., & Watkins, M. D. (2003). A dynamic model of top management team effectiveness: Managing unstructured task streams. *Leadership Quarterly*, *219*, 1–29.
- Feiger, S. M., & Schmitt, M. H. (1979). Collegiality in interdisciplinary health teams: Its measurement and its effects. *Social Science & Medicine*, *13A*, 217–229.

- Foushee, H. C., & Helmreich, R. L. (1988). Group interaction and flight crew performance. In E. L. Wiener, D. C. Nagel, & M. P. Friedman (Eds.), *Human factors in aviation* (pp. 189–227). San Diego, CA: Academic Press.
- Friedson, E. (1970a). *The profession of medicine*. New York: Dodd, Mead, and Co.
- Friedson, E. (1970b). *Professional dominance: The social structure of medical care*. Chicago, IL: Aldine Publishing Company.
- Friedson, E. (1994). *Professionalism reborn: Theory, prophecy, and policy*. Chicago, IL: University of Chicago Press.
- Fuchs, V. (1974). *Who shall live? Health, economics and social choice*. New York: Basic Books.
- Gibson, C. B., & Vermeulen, F. (2003). A health divide: Subgroups as stimulus for team learning behavior. *Administrative Science Quarterly*, 48, 202–239.
- Griffin, A. (1997). PDMA research on new product development practices: Updating trends and benchmarking best practices. *The Journal of Product Innovation Management*, 14, 429–458.
- Hafferty, F. W., & Light, D. W. (1995). Professional dynamics and the changing nature of medical work. *Journal of Health and Social Behavior*, 35, 132–153.
- Hafferty, F. W., & Wolinsky, F. D. (1991). Conflicting characterizations of professional dominance. *Current Research on Occupations and Professions*, 6, 225–249.
- Helmreich, R. L. (2000). On error management: Lessons from aviation. *British Journal of Management*, 320, 781–785.
- Hermann, C. F. (1963). Some consequences of crisis which limit the viability of organizations. *Administrative Science Quarterly*, 8, 61–82.
- Horbar, J. D. (1999). The Vermont Oxford Network: Evidence-based quality improvement for neonatology. *Pediatrics*, 103, 350–359.
- Hult, G. T. M., Hurley, R. F., Guinipero, L. C., & Nichols, E. L. (2000). Organizational learning in global purchasing: A model and test of internal users and corporate buyers. *Decision Sciences*, 31, 293–325.
- Institute of Medicine. (1999). In L. T. Kohn, J. M. Corrigan, & M. S. Donaldson (Eds.), *To err is human: Building a safer health system*. Washington, DC: National Academy Press.
- Institute of Medicine. (2001). *Crossing the quality chasm: A new system for the 21st century*. Washington, DC: National Academy Press.
- Institute of Medicine. (2003). *Keeping patients safe: Transforming the work environment of nurses*. Washington, DC: National Academy Press.
- Jacob, J., & Deshpande, S. P. (1997). The impact of ethical climate on job satisfaction of nurses. *Health Care Management Review*, 22, 76–80.
- Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. *Academy of Management Journal*, 33, 692–724.
- Kaissi, A., Kralewski, J., Curoe, A., Dowd, B., & Silversmith, J. (2004). How does the culture of medical group practices influence the types of programs used to assure quality of care? *Health Care Management Review*, 29, 129–138.
- Kenny, D. K., & LaVoie, L. (1985). Separating individual and group effects. *Journal of Personality and Social Psychology*, 48, 339–348.
- Kilo, C. M. (1999). Improving care through collaboration. *Pediatrics*, 103 (Supplement), 384–393.
- Kirchler, E., & Davis, J. H. (1986). The influence of member status differences and task type on group consensus and member position change. *Journal of Personality and Social Psychology*, 51, 83–91.
- Klein, A. L. (1976). Changes in leadership appraisal as a function of the stress of a simulated panic situation. *Journal of Personality and Social Psychology*, 34, 1143–1154.
- Leape, L. L., Bates, D. W., Cullen, D. J., Cooper, J., Demonaco, H. J., & Gollivan, T., et al. (1995). Systems analysis of adverse drug events. *Journal of the American Medical Association*, 274, 35–43.
- Leonard, M. S., Frankel, A., Simmonds, T., & Vega, K. B. (2004). *Achieving safe and reliable healthcare: Strategies and solutions*. Ann Arbor, MI: Health Administration Press.
- Littlepage, G., Robison, W., & Reddington, K. (1997). Effects of task experience and group experience on group performance, member ability, and recognition of expertise. *Organizational Behavior and Human Decision Processes*, 69, 133–147.
- Lovelace, K., Shapiro, D. L., & Weingart, L. R. (2001). Maximizing cross-functional new product teams' innovativeness and constraint adherence: A conflict communication perspective. *Academy of Management Journal*, 44, 779–793.
- MacDuffie, J. P. (1997). The road to “root cause”: Shop-floor problem-solving at three auto assembly plants. *Management Science*, 43, 479–502.

- Madhavan, R., & Grover, R. (1998). From embedded knowledge to embodied knowledge: New product development as knowledge management. *Journal of Marketing*, *62*, 1–12.
- Maxfield, D., Grenny, J., McMillan, R., Patterson, K., & Switzler, A. (2005). *Silence kills: The seven crucial conversations for healthcare*. Provo, UT: VitalSmarts, LC.
- McGregor, D. (1960). *The human side of enterprise*. New York: McGraw Hill.
- Mechanic, D. (1991). Sources of countervailing power in medicine. *Journal of Health Politics, Policy and Law*, *16*, 485–498.
- Messick, D. M., & Mackie, D. M. (1989). Intergroup relations. *Annual Review of Psychology*, *40*, 45–81.
- Milliken, F. J., Morrison, E. W., & Hewlin, P. F. (2003). An exploratory study of employee silence: Issues that employees don't communicate upward and why. *Journal of Management Studies*, *40*, 1453–1476.
- Mittman, B. S. (2004). Creating the evidence base for quality improvement collaboratives. *Annals of Internal Medicine*, *140*, 897–901.
- Morrison, E. W., & Phelps, C. C. (1999). Taking charge at work: Extrarole efforts to initiate workplace change. *Academy of Management Journal*, *42*, 403–419.
- Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological Review*, *93*, 23–32.
- Norrgrén, F., & Schaller, J. (1999). Leadership style: Its impact on cross-functional product development. *The Journal of Product Innovation Management*, *16*, 377–384.
- Nunnally, J. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- Oliva, R. (2001). Tradeoffs in response to work pressure in the service industry. *California Management Review*, *43*, 26–43.
- Pagliari, C., & Grimshaw, J. (2002). Impact of group structure and process on multidisciplinary evidence-based guideline development: An observational study. *Journal of Evaluation in Clinical Practice*, *8*, 145–153.
- Ryan, K. D., & Oestreich, D. K. (1991). *Driving fear out of the workplace: How to overcome the invisible barriers to quality, productivity, and innovation*. San Francisco: Jossey-Bass.
- Sarin, S., & Mahajan, V. (2001). The effect of reward structures on the performance of cross-functional product development teams. *Journal of Marketing*, *65*, 35–53.
- Schaefer, H. G., Helmreich, R. L., & Scheidegger, D. (1994). Human factors and safety in emergency medicine. *Resuscitation*, *28*, 221–225.
- Schein, E. H., & Bennis, W. (1965). *Personal and organizational change through group methods: A laboratory approach*. New York: Wiley.
- Schmitt, M. H. (1990). Medical malpractice and interdisciplinary team dynamics. In *Proceedings of the 12th Annual Interdisciplinary Health Care Team Conference* (pp. 53–66). Indianapolis, IN: Indiana University.
- Shamir, B., Zakay, E., Breinin, E., & Popper, M. (1998). Correlates of charismatic leader behavior in military units: Subordinates' attitudes, unit characteristics and superiors' appraisals of leader performance. *Academy of Management Journal*, *41*, 387–409.
- Shine, K. I. (2002). Health care quality and how to achieve it. *Academic Medicine*, *77*, 91–99.
- Shojania, K. G., McDonald, K. M., Wachter, R. M., & Owens, D. K. (2004). *Closing the quality gap: A critical analysis of quality improvement strategies*. AHRQ Publication No. 04-0051-1.
- Shortell, S. M. (1974). Occupational prestige differences within the medical and allied health professions. *Social Science and Medicine*, *8*, 1–9.
- Shortell, S. M., Rousseau, D. M., Gillies, R. R., Devers, K. J., & Simons, T. L. (1991). Organizational assessment in intensive care units (ICUs): Construct development, reliability, and validity of the ICU nurse-physician questionnaire. *Medical Care*, *29*, 709–726.
- Stamper, C. L., & Van Dyne, L. (2001). Work status and organizational citizenship behavior: A field study of restaurant employees. *Journal of Organizational Behavior*, *22*, 517–536.
- Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat-rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly*, *26*, 501–524.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Computer-assisted research and design*. Boston: Allyn and Bacon.
- Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel, & W. G. Austin (Eds.), *Psychology of intergroup relations* (pp. 7–24). Chicago: Nelson-Hall.
- Tucker, A. L., & Edmondson, A. C. (2003). Why hospitals don't learn from failures: Organizational and psychological dynamics that inhibit system change. *California Management Review*, *45*, 55–72.
- Tucker, A. L., Nembhard, I. M., & Edmondson, A. C. (2006). *The Effects of Learn-What and Learn-How on the Implementation Success of Improvement Projects*. HBS Working Paper No. 06-049.
- Tyler, T. R., & Lind, E. A. (1992). A relational model of authority in groups. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 25, pp. 115–191). New York: Academic Press.

- Van de Ven, A. H., Delbecq, A. L., & Koenig, R., Jr. (1976). Determinants of coordination modes within organizations. *American Sociological Review*, *41*, 322–338.
- Vinokur, A., Burnstein, E., Sechrest, L., & Wortman, P. M. (1985). Group decision-making by experts: Field study of panels evaluating medical technologies. *Journal of Personality and Social Psychology*, *49*, 70–84.
- Wachter, R. M. (2004). The end of the beginning: Patient safety five years after 'To Err is Human'. *Health Affairs*, *W4*, 534–545.
- Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly*, *40*, 145–180.
- Webster, M., & Foschi, M. (1988). *Status generalizations*. Stanford, CA: Stanford University Press.
- Weick, K. E. (2002). The reduction of medical errors through mindful interdependence. In M. M. Rosenthal, & K. M. Sutcliffe (Eds.), *Medical error: What do we know? What do we do?* (pp. 177–199). San Francisco, CA: Jossey-Bass.
- Weisband, S. P., Schneider, S. K., & Connolly, T. (1995). Computer-mediated communication and social information: Status salience and status differences. *Academy of Management Journal*, *38*, 1124–1151.
- Wind, J., & Mahajan, V. (1997). Issues and opportunities in new product development: An introduction to the special issue. *Journal of Marketing Research*, *34* (February), 1–12.
- Wolinsky, F. D. (1988). The professional dominance perspective, revisited. *The Milbank Quarterly*, *66*, 33–47.
- Yukl, G. (1994). *Leadership in organizations* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.
- Zimmerman, J. E., Shortell, S. M., Rousseau, D. M., Duffy, J., Gillies, R. R., & Knaus, W. A., Devers, K., Wagner, D. P., & Draper, E. A. (1993). Improving intensive care: Observations based on organizational case studies in nine intensive care units: A prospective, multicenter study. *Critical Care Medicine*, *21*, 1443–1451.