



# **Managerial practices that promote voice and taking charge among frontline workers**

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## Managerial practices that promote voice and taking charge among frontline workers

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Process-improvement ideas often come from frontline workers who speak up by voicing concerns about problems and by taking charge to resolve them. We hypothesize that organization-wide process-improvement campaigns encourage both forms of speaking up, especially voicing concern. We also hypothesize that the effectiveness of such campaigns depends on the prior responsiveness of line managers. We test our hypotheses in the healthcare setting, in which problems are frequent. We use data on nearly 7,500 reported incidents extracted from an incident-reporting system that is similar to those used by many organizations to encourage employees to communicate about operational problems. We find that process-improvement campaigns prompt employees to speak up and that campaigns increase the frequency of voicing concern to a greater extent than they increase taking charge. We also find that campaigns are particularly effective in eliciting taking charge among employees whose managers have been relatively unresponsive to previous instances of speaking up. Our results therefore indicate that organization-wide campaigns can encourage voicing concerns and taking charge, two important forms of speaking up. These results can enable managers to solicit ideas from frontline workers that lead to performance improvement.

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## **Managerial practices that promote voice and taking charge among frontline employees**

### **INTRODUCTION**

*Process improvement* refers to the application of methods to improve work processes with the goal of achieving higher levels of performance on some dimension, such as quality, efficiency, flexibility, or responsiveness (Anderson et al. 1994, Blumenthal and Kilo 1998, Shortell et al. 1998). Many process-improvement ideas come from frontline workers with firsthand knowledge of problems and how they can be resolved. When employees report accidents, near misses, and other operational problems—and their efforts to address these problems—this can provide managers with information unavailable elsewhere about opportunities to improve work systems (Cannon and Edmondson 2005, Hogan et al. 2008, Sitkin 1992). Managers can use this information to promote remedial and preventive measures (Madsen 2009) that can improve operational processes. Remedies derived from employee reports have brought about meaningful organizational improvements, including fewer errors (Stern et al. 2008), improved work systems (Tucker et al. 2008), and higher employee morale (Sobo and Sadler 2002). Research suggests that organizations can learn particularly effectively from failures (Madsen and Desai 2010). In contrast, when employees do not speak up, organizational silence can “shut down creativity and undermine productivity” (Perlow and Williams 2003: 3) and even imperil employees and customers (Detert and Treviño 2010). Many organizations and government agencies have therefore implemented confidential reporting systems (Barach and Small 2000, Billings and Reynard 1984, Farley et al. 2008), but their effectiveness depends on employees being willing to speak up about their concerns and about their actions to address problems as they arise.

The vast majority of incidents go unreported (Probst and Estrada 2010). Employees fail to speak up for a variety of reasons, including fear and perverse incentives, as described in detail below. While studies have identified a host of behavioral changes that individual managers or employees can engage in to foster speaking up within teams, far less is known about the efficacy of organization-wide efforts,

which can be less expensive, can require less training, and can be implemented more consistently and with less dependence on the level of support offered by any particular line manager. This paper focuses on an organization-wide process-improvement-oriented information campaign to encourage speaking up: a hospital's annual safety awareness campaign. Such campaigns seek to change employee behavior by disseminating information to employees rather than by attempting to alter individual managers' behavior. We argue that, just as public information campaigns can spur citizens to take particular actions such as wearing seat belts or quitting smoking, organizational information campaigns that encourage process improvement can lead employees to speak up. We focus on two forms of speaking up—voicing concern and taking charge—which we describe in detail below.

We also theorize circumstances in which process-improvement information campaigns are especially likely to be effective in promoting both forms of speaking up. The literature has suggested that *managerial responsiveness*<sup>1</sup> to process improvement can promote speaking up (e.g., Saunders et al. 1992, Tucker 2007); information campaigns could reinforce or undermine this relationship. We focus on managerial responsiveness because it reflects employees' local process-improvement environment, which contrasts with the organization-wide scope of process-improvement campaigns, allowing us to compare their effects. By examining how process-improvement campaigns and managerial responsiveness interact, our study is among the first to explore potential trade-offs and synergies between various management strategies to encourage employees to voice concern and take charge.

We test our hypotheses in the U.S. healthcare industry, a setting in which problems occur often and with consequences that can range from minor inconvenience to serious harm. Each year, operational problems in the U.S. healthcare industry result in tens of thousands of patient deaths and cost billions of dollars per year (Classen et al. 2011, Kohn et al. 2000, Landrigan et al. 2010, Office of Inspector General 2011, Van Den Bos et al. 2011). Organizations in many industries—including thousands of hospitals, the

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<sup>1</sup> Managerial responsiveness is similar to managerial openness, which was introduced by Ashford and colleagues (1998) and refers to “subordinates’ perceptions that their boss listens to them, is interested in their ideas, gives fair consideration to the ideas presented, and at least sometimes takes action to address the matter raised” (Detert and Burris 2007: 871). But while managerial openness is a perceptual measure based on employee assessments, managerial responsiveness is an indicator of managerial actions taken in response to concerns raised by staff members. As such, managerial responsiveness focuses on improvement-focused managerial actions rather than on words and behaviors that may convey openness to employees more generally.

focus of our empirical analysis—have implemented incident-reporting systems to encourage employees to speak up (Farley et al. 2008). While several studies have focused on the lower-than-expected use of incident-reporting systems (e.g., Leape 2002, Logio and Ramanujam 2010), ours is among the first to explore how these systems are actually used to achieve their objective of surfacing and resolving problems (Benn et al. 2009).

We analyze a panel dataset generated by the organization’s incident-reporting system, which employees can use to surface operational problems and improvement opportunities. We find that process-improvement campaigns are associated with increased voicing of concern and, in some circumstances, increased taking charge. We find that the former increases more than the latter. Our findings also reveal that process-improvement campaigns and managerial responsiveness act as substitutes in encouraging employees to take charge, with campaigns eliciting taking charge among employees with unresponsive managers. Our panel dataset, collected over several years, enables us to use lagged independent variables to overcome concerns about reverse causality and to use fixed effects to control for unobservable time-invariant factors within hospital units. Our results are also robust to several alternative specifications.

## **PRIOR LITERATURE**

*Speaking up* refers to voluntary efforts to raise an issue or concern to those in positions of higher authority. The literature on speaking up encompasses a number of theoretical constructs, such as voice, issue-selling, dissent, whistle-blowing, taking charge, breaking silence, and help-seeking (Ashford et al. 2007). We focus on the two forms of speaking up most relevant to process improvement in organizations: voicing concern and taking charge. *Voicing concern* refers to employees speaking up to constructively bring problems to the attention of managers (Detert and Burris 2007; Van Dyne et al. 2003), which often takes the form of calls for help that make managers aware of operational problems and process-improvement opportunities (Detert and Treviño 2010).

*Taking charge* occurs when frontline workers go one step further, informing managers of how they actually attempted to resolve problems (Morrison and Phelps 1999). Taking charge leverages frontline workers’ firsthand knowledge of the details—and often the root causes—of problems, which

enables them to offer particularly well-informed ideas about how to resolve them (Tucker 2007). Compared to voicing concerns, taking charge is a more constructive form of speaking up because it can mitigate consequences and prevent recurrences (Morrison and Phelps 1999).<sup>2</sup>

### **Impediments to Speaking Up**

Employees often fail to speak up because they are not convinced that the likely benefits will outweigh the potential personal costs (Detert and Treviño 2010, Kish Gephart et al. 2009, Milliken, Morrison, and Hewlin 2003, Morrison and Milliken 2000, Tangirala and Ramanujam 2008a, Van Dyne, Ang, and Botero 2003). Self-protection, resignation, and lack of other-orientation can deter speaking up (Van Dyne et al. 2003). Employees may be dissuaded from speaking up when they fear interpersonal risk (Ryan and Oestreich 1998, Edmondson 1996, 1999) and potential repercussions (Blatt et al. 2006, Kish Gephart et al. 2009) such as appearing incompetent by admitting an error or asking for help. Some may fear career consequences, including diminished prospects for promotions, raises, or project assignments. Even without such fears, employees may not be sufficiently motivated to invest the discretionary effort to speak up, particularly if they do not anticipate that their organization will respond productively or if they suspect that management's solutions will be no better than their own workarounds (Blatt et al. 2006, Tucker and Edmondson 2003, Tucker 2007). Employees may also lack interest in challenging the status quo for the benefit of colleagues and the organization (Van Dyne et al. 2003).

### **Encouraging Speaking Up**

The literature has identified a number of management practices that appear to overcome these obstacles. For example, managers can create a psychologically safe environment by behaving in ways that reduce perceptions of power and status differences so that employees perceive them as non-threatening (Detert and Burris 2007, Edmondson 1999, 2003, Nembhard and Edmondson 2006). This can decrease the perceived risk of reporting and discussing mistakes, which in turn has been associated with increased documented-error rates and interceptions of errors (Edmondson 1996). Managers can also motivate

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<sup>2</sup> We are not claiming that those who engage in taking charge are exhibiting greater intent to be constructive. We focus on behaviors rather than motives.

speaking up by conveying openness to suggestions and a willingness to listen, by responding to reported problems in a fair and supportive manner rather than blaming, and by taking action to address at least some of the matters raised (Ashford 1998, Detert and Burris 2007, Dutton and Ashford 1993, Morrison and Phelps 1999, Tangirala and Ramanujam 2008a, Tucker 2007). Managers can also reward employee contributions and coach employees to speak up (Edmondson 1999, 2003, Nembhard and Edmondson 2006).

These studies have identified how individual managers and employees can foster speaking up. Little is known about the efficacy of organization-wide efforts. In addition, because most research on speaking up has focused on single approaches, little is known about the potential synergies or conflicts between various approaches. By examining how an organization-wide approach interacts with the behavior of line managers, our study is among the first to explore such complementarities and trade-offs.

## **THEORY AND HYPOTHESES**

In this section, we hypothesize how an organization-wide process-improvement information campaign can encourage employees to engage in two forms of speaking up—voicing concern and taking charge. We also hypothesize how a campaign’s effectiveness in driving these behaviors depends on the responsiveness of employees’ line managers.

### **Process-Improvement Information Campaigns**

In general, an *information campaign* refers to “an organized set of communication activities” that seeks to influence targeted individuals’ perceptions and behaviors “to generate specific outcomes or effects...usually within a specified period of time” (Rogers and Storey 1987: 821). Public information campaigns, for example, often seek to influence particular segments of the citizenry to change social and political attitudes and behaviors such as household consumption patterns (Ettema, Brown, and Luepker 1983, Schultz et al. 2007, Vedung 1999), commuting choices (Henry and Gordon 2003), condom usage to prevent sexually transmitted diseases (de Walque 2007, Frölich and Vazquez-Alvarez 2009, Singer et al. 1991), recreational drug use (Schmeling and Wotring 1980), seat-belt usage, and littering.

Many organizations have deployed information campaigns to encourage employees to engage in

specific behaviors, including working more safely, exercising and eating healthily, and making charitable contributions. We focus on *process-improvement campaigns*, information campaigns that seek to improve an organization's operational performance. Process-improvement campaigns can encourage employees to speak up via three mechanisms. First, the campaign can encourage employees to internalize the campaign's underlying message that process improvement is important to the organization. This would promote pro-social, other-oriented behaviors by motivating a spirit of cooperation and altruism (Van Dyne et al. 2003). Research suggests that outstanding operational performance requires leaders to instill a strong culture "that empowers employees to think and act on their own in pursuit of strategic objectives, increasing their commitment to those goals" (Chatman and Cha 2003: 23). Campaigns emphasizing process improvement can help inculcate such a culture and foster voluntary efforts among employees to enhance process improvement. By signaling that the organization expects employees to participate in problem solving and process improvement, process-improvement campaigns can prompt employees to expend the effort to speak up.

Second, process-improvement campaigns often highlight examples of how speaking up has already led to problems being solved and processes being improved (Denning 2004), which increases the salience and relevance of speaking up. In this way, campaigns can overcome employee resignation and increase willingness to expend the effort to speak up by convincing employees that their efforts will spur action (Van Dyne et al. 2003).

Third, process-improvement campaigns can reduce defensiveness and self-protective behaviors motivated by fear (Van Dyne et al. 2003). Specifically, these campaigns typically explicitly invite and appreciate employees' contributions, which reduce the perceived risks of speaking up (Nembhard and Edmondson 2006).

For these reasons, we hypothesize that:

HYPOTHESIS 1 (H1). Process-improvement campaigns will increase employees' speaking up.

Process-improvement campaigns may bolster particular forms of speaking up more strongly than others. Whereas voicing concern requires the reporter only to describe a situation, taking charge requires



more effort to describe problem-solving activities, often including steps to analyze evidence. Although we predict that process-improvement campaigns increase the salience of both forms of speaking up and strengthen the belief that speaking up will lead to problems being solved, several factors lead us to expect that campaigns will more effectively spur workers to voice concern than to take charge. First, because campaigns use information to convey positively-framed improvement-focused reminders rather than scare tactics or the threat of punishment, it seems more likely that they will motivate the lesser efforts required to voice concern than the greater efforts required to take charge.

Second, campaigns can stimulate speaking up by convincing employees that what they say will be heard and acted upon. This can motivate formerly reluctant employees to come forward and voice concern. In contrast, an employee who has already taken action in response to an incident may feel she has already solved her own problem and has little left to gain by reporting that she has done so.

Finally, while an employee who reports a problem risks being labeled a whiner or complainer (Tucker and Edmondson 2003), one who also reports taking action faces additional interpersonal and professional risk (Edmondson 1999) from a manager who disagrees with that action or who feels that the employee has usurped the manager's authority (Argyris 1985). Consequently, although process-improvement campaigns reduce the fear of interpersonal risk by explicitly inviting employee contributions, they may be more successful at overcoming the comparatively lower barriers to voicing concern than at overcoming the higher barriers to taking charge.

We thus hypothesize:

HYPOTHESIS 2 (H2). Process-improvement campaigns will lead to an increase in employees' voicing concerns greater than the increase in taking charge.

### **Process-Improvement Campaigns and Managerial Responsiveness**

Employees' perceptions of organization-wide process-improvement campaigns are likely to be shaped by their line managers. A particularly important factor is *managerial responsiveness*, or how line managers have historically addressed issues raised by their employees. Employees can perceive process-improvement campaigns as an invitation by senior management to speak up, which can be especially

motivating to those employees intrinsically inclined to act but reluctant to do so because of their line manager's unresponsiveness.

For employees with unresponsive managers, process-improvement campaigns can provide the incentive to make the relatively small effort to voice concern and incur the interpersonal risk. Such campaigns can shift these employees' perceptions toward believing that their concerns will at least receive attention from senior management, if not from their own line managers (Detert and Trevino 2010). In contrast, campaigns are unlikely to encourage more voicing of concerns among employees with responsive managers; those inclined to voice concern will already be doing so.

For these reasons, we hypothesize:

HYPOTHESIS 3a (H3a). Process-improvement campaigns will lead to a greater increase in voicing concern among employees with unresponsive managers than among those with responsive managers.

Prevailing levels of managerial responsiveness will also affect the extent to which process-improvement campaigns increase employees' propensity to speak up in the form of taking charge. As mentioned earlier, compared to voicing concern, taking charge requires more effort, provides less opportunity for personal gain, and involves more risk to one's relationship with one's line manager. Some line managers view taking charge behaviors, including deciding which problems to solve and how to solve them, to be within their own purview; subordinates who do so are therefore a threat to their authority.

Employees whose unresponsive managers have made taking charge behaviors seem not only futile but also unwanted are especially likely to welcome an organizational process-improvement campaign as a rare moment in which taking charge will be valued, at least by senior management. This might be enough to motivate them to take the interpersonal risk and expend the extra effort. In contrast, employees who have responsive managers and already feel comfortable taking charge are not likely to feel any more so due to an information campaign.

We therefore hypothesize that:

HYPOTHESIS 3b (H3b). Process-improvement campaigns will lead to a greater increase in taking

charge among employees with unresponsive managers than among those with responsive managers.

## **EMPIRICAL SETTING AND DATA**

We test our hypotheses using data from a large Massachusetts hospital's electronic incident-reporting system, a type of dataset which few studies have investigated because access is restricted to protect the confidentiality of patients and healthcare providers. Incident-reporting systems capture information about medical errors, near-misses, and safety concerns, some of which might have the potential to harm patients. The hospital's incident-reporting system, a commercial database customized by the hospital, was implemented in June 2004. A dedicated patient-safety team of four employees is responsible for managing the system and facilitating incident follow-up. Reporting is strictly voluntary and confidential (but not anonymous) as is the case with most incident-reporting systems in other industries (Barach and Small 2000).<sup>3</sup> Any hospital employee can file an incident report, which involves responding to a set of structured, semi-structured, and free-text questions to gather basic information about the incident (e.g., type, date, and time), the people involved (e.g., the names of the patient, staff, and doctors), the outcome of the incident (e.g., the degree of patient harm that resulted), contributing factors, and actions taken in response to the incident. After a report is filed, it is automatically routed to a designated line manager, process manager, risk manager, and patient-safety manager.<sup>4</sup> While any of these managers can enter additional information about the incident, line managers are primarily responsible for follow-up. Managers have the opportunity to populate a set of fields in the system pertaining to their own actions taken in response to the incident; this information is visible to and modifiable only by those with manager-level access.

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<sup>3</sup> The system is considered confidential but not anonymous because when an employee files a report, her or his employee ID is captured by the system. There are six types of managers who can view reports: risk managers, patient-safety managers, unit managers, process managers, nursing managers, and medical directors. All except medical directors can see the employee's ID and look up her or his name and contact information if needed for follow-up. These managers are not, however, allowed to reveal the employee's identity.

<sup>4</sup> The risk-management department and the patient-safety manager receive all incident reports. A unit manager receives reports of incidents that take place in his or her unit. Process managers receive reports related to specific incident types, regardless of unit. Nursing managers receive reports in which death or permanent harm resulted. Finally, medical and administrative directors of particular service lines receive reports of incidents involving patients admitted to those lines. If incidents involve multiple units, reports are disseminated accordingly.

We examined incidents that were reported by all 157 work units, which are physically defined areas within the hospital in which different types of healthcare and related services are delivered (e.g., pediatric, intensive care, and chemotherapy). Our sample includes incidents reported between January 1, 2005 and May 31, 2008, a period that begins six months after the system was installed (to avoid potentially inaccurate data entered during the start-up period) and extends through the most recent reports we could obtain.

We further restricted our analytic sample to a subset of incident types that rarely suffered from a particular form of miscoding error that we identified. Upon reviewing a sample of incident reports, we discovered instances in which the reporter had described actions taken but had erroneously entered them in the “incident description” text field rather than in the “actions taken” text field and tick boxes. In such cases, relying on content in the “actions taken” section would lead to measurement error caused by failing to capture incident reports that included actions taken. To minimize such measurement error, we restricted our sample to the following four incident types in which such miscoding was rare: (1) *surgery/procedure* incidents, which are related to the ordering, preparation, or performance of a surgical procedure or anesthesia; (2) *blood/blood product* incidents, which are related to the prescribing, processing, dispensing, or administration of blood or blood products; (3) *lab specimen/test* incidents, which are related to the ordering, preparation, performance, or results of a lab specimen/test; and (4) *identification/documentation/consent* incidents, which are related to patient identification procedures and documentation of consent in the patient chart but are not a contributing factor to an incident of another type. These four focal incident types make up 50% of all incidents in our dataset.<sup>5</sup>

To assess how similar the hospital that provided our dataset is to other hospitals in Massachusetts with regard to the types of incidents that occur, we examined the number of serious reportable events that hospitals were legally required to report to the state regulator. Our focal hospital identifies these specific types of event through a process that is distinct from the incident-reporting system used for the current study. According to a 2008 assessment (Massachusetts Department of Public Health 2009), the number

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<sup>5</sup> In a robustness test described below, we used a sample that included incidents of all types to re-estimate our model that predicted speaking up. The results were consistent with our primary results.

of serious reportable events submitted by our focal hospital<sup>6</sup> was within one standard deviation (1.37) of the average rate of 1.06 serious reportable events per 10,000 patient-days for all hospitals in Massachusetts. Comparing the three most common types of serious reportable event, our focal hospital had a slightly lower proportion of the hospital-environment events (e.g., electrical shocks, burns, falls) than the average hospital in Massachusetts, a higher proportion of care-management events (e.g., medication errors), and about the average proportion of surgical events (e.g., incorrect surgical procedures). This offers some indication that our setting includes a range of work-related problems similar to that of other hospitals across Massachusetts and supports the generalizability of our analysis.

## Measures

**Speaking Up.** Speaking up reflects employees' decisions to bring problems to management's attention. Because our focal hospital operates an incident-reporting system, we operationalize speaking up based on incident reports, as others have done (e.g., Garbutt et al. 2008). Specifically, we measured *speaking up* as the number of incident reports filed by employees within each hospital unit per week.

**Taking Charge.** We operationalize taking charge in our context by focusing on instances in which employees who decided to speak up by filing an incident report also provided managers with information about actions taken to resolve the problem. We measured *taking charge* as the weekly number of incident reports within each hospital unit that featured actions taken by employees in response to the incident. Our operationalization of taking charge is consistent with previous approaches to measuring taking charge (Morrison and Phelps 1999).

**Voicing Concern.** Employees exhibit voicing concern when they file incident reports that describe problems but not actions taken in response. To capture the prevalence of this behavior, we measured *voicing concern* as the weekly number of incident reports in each hospital unit that describe the incident but do not report any actions taken in response. While previous approaches to measuring voice have included actions and suggestions by workers to resolve problems (Detert and Burris 2007, Van Dyne and LePine 1998), our operationalization is intended to carefully differentiate voicing concern from

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<sup>6</sup> To preserve anonymity, we cannot disclose the number of serious reportable events our focal hospital submitted.

taking charge.

**Process-Improvement Campaign.** The hospital runs an annual patient-safety awareness week in early March as a process-improvement campaign designed to increase patient safety throughout the hospital. The hospital schedules this campaign to occur during the National Patient Safety Foundation's annual Patient Safety Awareness Week. The campaign (a) explains to employees when and how they should file incident reports, (b) highlights prior incident reports that resulted in specific improvements, (c) promotes increased incident reporting by entering staff in a lottery for gift certificates or by awarding credit in the hospital cafeteria for each report filed during the campaign week, and (d) promotes patient-safety practices via the hospital bulletin, a table with patient-safety materials, and a patient-safety knowledge contest (e.g., a crossword puzzle or quiz). According to the hospital's patient-safety team members, these annual campaigns result in heightened safety awareness for approximately six weeks, beginning with the one-week campaign. We created a dichotomous variable, *process-improvement campaign*, coded "1" for reports filed for incidents within that six week period and "0" otherwise.<sup>7</sup>

**Managerial Responsiveness.** To measure managerial responsiveness, we refer to the extent to which line managers at the focal hospital report actions they take in response to their employees filing incident reports. Once a frontline worker files an incident report, his or her line manager is the primary person tasked with responding. The report triggers an automatic e-mail to the manager, who can then enter information into a structured field to record whatever actions he or she has taken in response to the incident. Examples include "communication process enhanced" and "leadership/responsibility defined." Frontline workers observe the changes resulting from their manager's actions and those who report incidents also receive a monthly e-mail that highlights the latest actions taken in response to incident reports. Our measure of managerial responsiveness represents occasions when managers recorded specific actions taken in response to incidents. Because the incident-report system's structured field records the manager's actions taken as a series of tick-boxes, our measure is immune to measurement error that might occur if managers could make entries that merely critiqued the content of incident reports or recorded that

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<sup>7</sup> A set of robustness tests, described below, confirmed that our results were not meaningfully changed by altering the coding of the duration of the campaign.

the manager was not planning to take action.

We created a variable that captures the overall level of *managerial responsiveness to process improvement* within each unit, measured as the proportion of a unit's incident reports filed in the prior six months in which managers recorded actions taken. For example, to construct this measure for a particular hospital unit in June 2007, we calculate the proportion of incident reports filed in that unit during December 2006-May 2007 for which the manager recorded actions taken. Capturing managerial responsiveness during the six months preceding an incident captures the prevailing level of responsiveness in the unit and overcomes concerns about reverse causality.

## **EMPIRICAL APPROACH AND RESULTS**

### **Empirical Models**

To assess how process-improvement campaigns and managerial responsiveness affect speaking up, voicing concern, and taking charge, we estimated the following model for hospital unit  $j$  in week  $t$ :

$$Y_{j,t} = F(Camp_t, MgrResp_{j,t-1to6}, Year_t, Unit_j)$$

where  $F(\cdot)$  is the Poisson function.  $Y_{j,t}$  represents either (a) the overall number of incident reports (speaking up), (b) the number of incident reports that include actions taken (taking charge), or (c) the number of incident reports that report a problem but do not include actions taken (voicing concern). In all cases, these outcomes are modeled as a function of whether they occurred during the week of the hospital-wide process-improvement campaign or any of the subsequent five weeks ( $Camp_t$ ) and of the level of managerial responsiveness in process improvement within the hospital unit in the previous six months ( $MgrResp_{j,t-1to6}$ ). We include a full set of year dummies ( $Year_t$ ) to account for the possibility that reporting levels might be affected by changes in annual budgets and strategic priorities, whether or not the hospital was subjected to a biannual visit by the Joint Commission to reevaluate its accreditation status, and other differences between years.

We also include (conditional) fixed effects at the hospital-unit-level, which control for unit-specific time-invariant factors—such as the types of activities conducted in the unit, the number of beds, and the unit's profitability (Horwitz 2005)—that could affect the content or frequency of the unit's

incident reports.<sup>8</sup> In addition, we confirmed with our contacts at the focal hospital that no major changes occurred in the hospital that changed unit size or activity scope during our sample period. Because our empirical models include unit-level fixed effects and lagged measures of managerial responsiveness, our analysis identifies changes in outcomes within particular units that follow changes in managerial responsiveness. Therefore, to the extent that a unit has the same employees over time and the behaviors of the employees and their manager are consistent over time, our analysis would not yield significant effects.

To test whether managerial responsiveness moderates the impact of process-improvement campaigns on various outcomes (H3a and H3b), we also include a term that interacts *managerial responsiveness* with *process-improvement campaign*.

## Results

Because our models predict count variables, we use conditional fixed-effects quasi-maximum likelihood Poisson regression and report robust standard errors to control for mild violations of the distribution assumption that the variance equals the mean (Cameron and Trivedi 2009). Summary statistics and correlations of our estimation sample are reported in Table 1. Our estimation sample includes 19,016 observations from 134 hospital units over 142 weeks, which excludes the 23 units with no incident reports filed over the entire 142-week period; conditional fixed-effects Poisson regression models drop units that lack variation in the outcome. In our sample, employees from each hospital unit filed an average of 0.5 incident reports per week or two per month. Regression results are reported in Table 2.

**Process-Improvement Campaigns.** The results of our primary model that predicts the frequency of speaking up indicate that process-improvement campaigns increase the number of incident reports (Table 2, Model 1:  $\beta=0.15$ ,  $p<0.01$ ), which supports Hypothesis 1. The average marginal effect

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<sup>8</sup> We confirmed the explanatory power of unit-level controls by estimating a (conditional) fixed-effects Poisson regression model predicting speaking up, which indicated that the unit dummies were highly statistically significant (joint Wald test:  $\chi^2=5.2e+14$ ;  $p<0.001$ ). Further evidence was provided by a likelihood ratio test that strongly indicated that this (unconditional) unit fixed-effects Poisson regression model provided a better fit than a pooled Poisson regression model that omitted the fixed effects ( $\chi^2=19009$ ;  $p<0.001$ ).



(partial effect) of 0.08 reflects an increase from 0.49 incident reports per week per hospital unit to 0.57 during the week in which the campaign occurs and the following five weeks. To put this additional 0.08 reports in perspective, it is equivalent to 11 additional reports filed per week across the 134 hospital units during a week in which the campaign occurred or any of the following five weeks, a 17% increase over the 66 reports filed weekly in these units outside the campaign period.

We find evidence that campaigns lead to an increase in the frequency of voicing concern (Model 2:  $\beta=0.22$ ,  $p<0.01$ ) but no evidence that campaigns are associated with an increase in taking charge (Model 3:  $\beta=-0.11$ ,  $p=0.12$ ). The former coefficient is significantly larger than the latter (seemingly unrelated regressions: Wald  $\chi^2=9.32$ ,  $p<0.01$ ), which supports Hypothesis 2 that campaigns are more likely to increase reports that voice concern than reports of taking charge.

**Process-Improvement Campaigns and Managerial Responsiveness.** To test Hypotheses 3a and 3b, we assessed whether managerial responsiveness moderated the relationship between process-improvement campaigns and voicing concern (H3a) or taking charge (H3b). In the model predicting the number of reports documenting problems but not actions (voicing concern), the coefficient on managerial responsiveness interacted with process-improvement campaign was near zero and not significant (Model 4:  $\beta=0.02$ ,  $p=0.92$ ), providing no support for Hypothesis 3a that predicted these strategies operated as substitutes in encouraging employees to voice concern. When predicting the number of incident reports with reported actions (taking charge), the interaction term was negative and statistically significant (Model 5:  $\beta=-0.62$ ,  $p<0.10$ ), providing evidence of the substitution effect predicted by Hypothesis 3b. This moderated effect is depicted in Figure 1, which graphs the average predicted weekly number of incident reports with documented actions across various levels of managerial responsiveness, both during and outside of process-improvement campaign periods. Outside of campaign periods, the number of incident reports with documented actions remains consistent, at one report per unit exhibiting taking charge every 10 weeks (i.e., 0.1 per unit-week), regardless of the level of managerial responsiveness. During campaign periods, units with lower levels of managerial responsiveness (ranging 0% to 20%) exhibit a significant increase in taking charge: the 95% confidence intervals surrounding the two lines

depicted in Figure 1 do not overlap only when managerial responsiveness ranges from 0% to 20%. We find no evidence that campaigns affect taking charge in units with high levels of managerial responsiveness: the 95% confidence intervals surrounding the two lines substantially overlap at managerial responsiveness levels above 20%.

## **Robustness Tests**

We conducted several tests to assess the extent to which our results were sensitive to how our independent and dependent variables were measured.

**Length of Process-Improvement Campaign Period and Effect of Incentives.** As described earlier, we defined process-improvement campaigns to span a six-week period based on our hospital contacts' estimation of the duration of their campaign's effect. To assess the extent to which our results were sensitive to this particular duration, we also estimated models using a four-week period and an eight-week period (in each case beginning with the one-week campaign). The results are nearly identical to our primary results for all the outcomes, suggesting that our results are not driven by the selection of a specific period.

We also examined whether the increase in speaking up during the campaign period occurred primarily during the first week, when there were incentives such as cafeteria credits. If this were the case, the increased reporting we observed during campaigns could be largely attributed to these incentives rather than, as we theorized, to employees internalizing the campaign's message, finding the message more salient, or decreasing self-protective behavior. To assess this, we substituted our six-week campaign variable with two variables: The first captured the first week of the campaign (when incentives were available) and the second captured the remaining five weeks. The coefficients on these two variables were nearly identical ( $\beta=0.151$  and  $\beta=0.153$ , respectively) and statistically indistinguishable (Wald  $\chi^2=0.00$ ,  $p=0.98$ ), suggesting that our results are not due to incentives.

**Timeliness of Managerial Responsiveness.** Our measure of managerial responsiveness examines whether line managers documented actions in response to incident reports. We put no temporal restrictions on these managerial responses, which means that we drew no distinction between a manager

who typically documented her response within a week of an incident report being filed and one who typically took several months to do so, as long as they both responded to the same proportion of reports filed within their hospital units. In fact, the time to manager response varied substantially in our sample, ranging from same day (a 0-day lag, the 5th percentile of our sample) to 250 days (the 95th percentile of our sample). Since frontline staff might experience longer time lags as less managerial responsiveness, we created several alternative measures of managerial responsiveness in order to assess the extent to which delayed managerial responses were driving our results. First, we only considered managerial responses within three weeks of the incident report being filed, which included the 66th percentile of most rapid managerial responsiveness. We then expanded this threshold to four weeks and to five weeks, which included the 72nd and 75th percentiles, respectively. Estimating our models using these alternative measures, which consider only particularly rapid responses, yielded results nearly identical to our primary results, which did not impose such time limits. Specifically, Wald tests indicated that coefficients on the interaction terms were statistically indistinguishable from our primary results, regardless of which of the three alternative thresholds we imposed.

**Types of Incident.** As described above, we sought to minimize error associated with our measures of taking charge and voicing concern by restricting our sample to the four incident types for which employee actions were most often correctly coded. Whereas the coding error we sought to avoid could confound our models that predict taking charge or voicing concern, by causing improperly recorded reports of taking charge to be treated as reports of voicing concern, it cannot bias our models that predict speaking up because speaking up is measured as the total weekly count of incident reports per unit, irrespective of the reports' content. To assess the extent to which our results based on the four focal incident types might generalize to all incident types, we estimated a model predicting speaking up based on all 13 incident types—our focal four plus airway management, coordination of care, diagnosis/treatment, diagnostic test, environment, fall, line/tube (related to intravenous therapy), maternal/childbirth, and skin/tissue. The results indicate that campaigns are associated with a significant increase in speaking up ( $\beta=0.13$ ,  $p<0.01$ ); this coefficient was nearly identical to the coefficient in our

primary results. Indeed, the two coefficients were statistically indistinguishable (seemingly unrelated regressions: Wald  $\chi^2=1.08$ ,  $p=0.30$ ).

Because our data comes from a hospital setting in which some incidents could have life-or-death consequences, our results might be less broadly applicable to empirical domains in which the stakes are not so high. To assess this, we estimated a series of models that omitted incidents classified by reporters as resulting in temporary patient harm, permanent patient harm, or death. Estimating our models on the remaining subsample of incidents in which there was no patient harm yielded results nearly identical to those from our primary models. This implies that our results are not being driven by high-stakes incidents and supports the generalizability of our analysis.

### **Extension: Incident-Level Data**

Our primary results supporting H3b indicate that, during campaigns, the *frequency* of employees taking charge, as measured by the weekly number of reports with documented actions within each unit, increased in units with lower levels of managerial responsiveness. As an extension, we sought to explore whether the *probability* that an individual incident report reflected taking charge increased during campaigns and whether the magnitude of the increase depended on the level of managerial responsiveness in the reporting employee's unit. We pursued this analysis because we found that campaigns increased all forms of speaking up and managers might be interested in understanding how the composition of reports changes during campaigns. In addition, analyzing this question at the incident-report level enables us to control for various incident-specific factors.

We estimated a logistic regression model that uses individual incident reports as the unit of analysis to predict the probability that taking charge will be reflected in a report. The focal independent variables indicate whether or not the incident was reported during a process-improvement campaign, the level of managerial responsiveness in the reporter's unit, and the interaction between these two factors. We control for an array of incident-specific factors that may be associated with the probability of taking charge, including the level of patient harm (if any) resulting from the incident and whether equipment was involved. We include a series of dummies to account for differences between the four focal incident types

and for the months and years when reports were filed. We also include conditional fixed effects to control for differences between hospital units. The measures, model, and estimation approach of this conditional fixed-effects logistic regression model are described in detail in the Appendix, with summary statistics and correlations reported in Table A-1 in the Appendix.

The results, reported in Table A-2, reflect a moderated relationship similar to that found in our primary analysis. Specifically, coefficient on the term that interacted campaigns with managerial responsiveness is negative and statistically significant (Model 2:  $\beta=-1.07$ ,  $p<0.05$ ), which implies that campaigns are especially likely to increase the probability that an incident report includes taking charge among reports filed in units with low managerial responsiveness. This moderated effect is also depicted in Figure A-1, which graphs the average predicted probability that an incident report will include taking charge across various levels of managerial responsiveness, both during and outside of process-improvement campaign periods. In contrast to the relatively flat line indicating that taking charge is largely insensitive to managerial responsiveness outside campaigns, managerial responsiveness influences the likelihood of taking charge during campaign periods.<sup>9</sup> These results broaden the support for Hypothesis 3b, which, when combined with our primary result, indicates that process-improvement campaigns and managerial responsiveness operate as substitutes in increasing both the frequency and the likelihood of taking charge.

## **DISCUSSION**

Identifying and addressing operational problems improves organizational performance (Tucker 2004). Process-improvement ideas often come from frontline workers. However, little is known about how specific management practices spur employees to speak up to facilitate problem solving. We examined this question in the healthcare setting, in which operational problems are common and could have severe consequences and in which many organizations have implemented confidential incident-

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<sup>9</sup> Examining the 95% confidence intervals surrounding the lines depicted in Figure A-1 revealed that it was only in units with low managerial responsiveness that levels of taking charge significantly differed between campaign and non-campaign periods. Only in that region did these confidence intervals not overlap. While Figure A-1 seems to suggest that units with high managerial responsiveness exhibit lower levels of taking charge during campaign periods, these differences are not statistically significant; the 95% confidence intervals overlap widely at high levels of responsiveness.

reporting systems.

Our research demonstrates that process-improvement campaigns are associated with increases in speaking up. This suggests that a campaign is a managerial strategy that prompts employees to invest additional effort and incur additional interpersonal risk to report operational problems. Campaigns are more effective at bolstering the frequency of voicing concern than that of taking charge. We argue that this is because voicing concern requires less effort and interpersonal risk and offers more potential for personal benefit than taking charge does.

Our findings also demonstrate that process-improvement campaigns are particularly effective in bolstering the frequency of taking charge in units with relatively unresponsive line managers, whereas we found no such effect in units with relatively responsive managers. This suggests that organization-wide process-improvement campaigns can elicit taking charge by compensating for line managers' low responsiveness. In contrast, we find no evidence that process-improvement campaigns led to a greater increase in voicing concern among employees with unresponsive managers than among those with responsive managers. Instead, we find a broader impact of campaigns, in that they increase voicing concern among employees across units irrespective of managerial responsiveness. This may result from campaigns reminding employees that the concerns they voice will be forwarded to the organization's management, well beyond their line manager, which creates different, but very real incentives to voice concerns for those whose managers have exhibited low or high responsiveness. Campaigns might inform or remind employees with relatively unresponsive managers that the organization is seriously interested in hearing their concerns. For employees with responsive managers, campaigns can provide an opportunity to redouble their efforts to surface problems. Future research is needed to better understand the mechanisms driving these effects.

## **Contributions**

Our research identifies organization-wide process-improvement-oriented information campaigns as an approach that can increase employees' speaking up. Process-improvement campaigns have garnered little attention in the management literature. While similar campaigns are commonly used to

promote particular behaviors among citizens in the public sphere, our research highlights the potential contribution of this type of initiative as an organizational-level management tool that can spur particular behaviors among employees.

Our study contributes to the literature on information campaigns. Despite the prevalence of information campaigns, evaluation researchers “have found it difficult to produce unambiguous evidence of impact” due in part to methodological challenges such as determining the extent to which target populations were exposed to the campaign (Weiss and Tschirhart 1994: 85). After reviewing evaluations of public information campaigns that sought to promote healthy behavior, Aitkin and Salmon (2010: 419) concluded that “the preponderance of evidence shows that conventional campaigns typically have only limited direct and immediate effects.” Whereas public information campaigns have been subjected to many evaluations (Aiken and Salmon 2010), our study is among the first to examine the effectiveness of organizational—rather than public—information campaigns. Researchers interested in evaluating public information campaigns might benefit from using organizations as pilot sites since organizations overcome some of the methodological challenges that accompany campaigns targeting the general citizenry.

Our paper also extends the process-improvement literature by investigating a specific managerial practice and revealing how another practice moderates its effectiveness in prompting frontline workers to speak up in ways that could improve work processes. Much of the process-improvement literature recognizes how valuable frontline workers can be as a resource for prioritizing problems and identifying effective solutions (e.g., MacDuffie 1997, Tucker and Edmondson 2003) but also suggests that learning from frontline workers is difficult because information is local and groups often fail to reflect on their work (Edmondson 2002). Process-improvement strategies emanating from Japan have highlighted the need for managers to observe problems on the front lines (Imai 1996) and have recommended specific practices, such as Toyota’s andon cord, which enable workers to signal problems and stop production until countermeasures can be applied (Spear and Bowen 1999). However, such strategies have met resistance outside Japan, due to the way they shift power from managers to workers and to the cultural change this requires (Young 1992). The managerial approach we examine, process-improvement

campaigns, leverages frontline workers' knowledge to improve processes without disrupting traditional hierarchical relationships.

Our study is among the first to hypothesize and reveal important interactions between alternative managerial approaches to encouraging employees to speak up. The substitution effect we identified for taking charge suggests that organization-level efforts to encourage this behavior can compensate for line managers who do not create an environment that inspires frontline workers to do so. This finding complements important employee-level interactions that others have identified between individual employee characteristics and their perceptions of their work climate (Detert and Burris 2007, Tangirala and Ramanujam 2008a, 2008b). Thus, employee willingness to speak up is influenced not only by individual characteristics (e.g., personality, satisfaction, job demography, workgroup identification, and professional commitment), but also by an array of managerial actions by both line managers and more senior managers.

This result also contributes to the literature that examines how managers at multiple levels can influence speaking up. It suggests that process-improvement campaigns sponsored by senior management can offset the limited enthusiasm or prioritization of line managers and create conditions more favorable for employees to speak up. It is consistent with research suggesting that senior managers can encourage or impede speaking up among employees (Dutton et al. 2002, Detert and Treviño 2010). Our findings also complement prior research showing that positive leadership by line managers offsets the negative effects of senior managers (Zohar and Luria 2005).

### **Limitations and Future Research**

We acknowledge a number of limitations to our study. Many scholars have described how organizational culture affects incident reporting (Waring 2005), dedication to quality improvement (Carman et al. 1996), and safety outcomes (McFadden, Henagan, and Gowen 2009, Singer et al. 2009, Vogus and Sutcliffe 2007). Others have found that an employee's willingness to speak up can be influenced by individual characteristics such as his or her level of job satisfaction (Rusbult et al. 1988) and by the interactions between individual traits and such team characteristics as group size and self-



management (Blatt et al. 2006, LePine and Van Dyne 1998, Tangirala and Ramanujam 2008a, 2008b). Prior research on the effectiveness of public information campaigns also suggests that individuals who have incentives, who have the ability to change their behavior, and who are motivated by the message of the campaign are especially likely to respond (e.g., Mendelsohn 1973, Vedung 1999). Our single hospital context enabled us to control for organization-level culture as well as cultural elements that are geographically based and our measure of managerial responsiveness and fixed effects enabled us to control for some cultural aspects at the hospital-unit level. However, we acknowledge that other time-variant unit-level factors, as well as individual employee characteristics, could also influence how often people report incidents, demonstrate or recommend solutions (Edmondson 2004, Naveh et al. 2005), or engage in process improvement (Tucker, Nembhard, and Edmondson 2007). Confidentiality restrictions prevented us from accessing other measures of unit-level culture or individual reporter characteristics as well as additional variables we would have liked to use as controls (e.g., time-varying unit-level characteristics and manager characteristics). While we do not believe that omitting these variables introduces serious bias in favor of the results we find, we suggest that future research examine how they affect problem solving in response to reported incidents across several organizations as well as within different units of the same organization. We also recognize that our measure of managerial responsiveness has limitations, including the possibility that employees may not be fully or equally aware of their line manager's responsiveness to prior incident reports. On the other hand, our approach overcomes concerns that perceptual measures might be biased (Detert and Burris 2007).

Another potential limitation of our study is our exclusive reliance on the organization's incident-reporting system to measure speaking up and managerial responsiveness. We acknowledge that some employees and managers in our focal organization might also work together to improve work processes through informal discussions (Frankel et al. 2008, Tucker and Singer 2009, Zohar 2002), although this potential threat to validity would be attenuated by the extent to which these alternative mechanisms are positively correlated with those we observe in our dataset. We encourage future researchers to examine both formal processes, such as incident-reporting systems, and informal interactions among employees

and managers in order to construct a more comprehensive understanding of effective managerial approaches to improving work practices. Future research could also examine how the two management practices we studied—process-improvement campaigns and managerial responsiveness—might interact with other approaches that have been shown to encourage employee suggestions, including strong social pressure, mandatory quotas of suggestions, and rewards (Young 1992).

Another potential limitation derives from the fact that our focal hospital, like most hospitals, does not track—nor could we obtain in any other way—the number of incidents that actually occurred. We could only analyze the incidents that were reported. This discrepancy could affect the interpretation of our count models, which implicitly rely on the assumption that the hospital did not experience an increase in *unreported* incidents during process-improvement campaigns or within units exhibiting higher levels of managerial responsiveness. While neither we nor the focal hospital’s patient-safety team see any theoretical or practical reason to question this assumption, we nonetheless highlight that it underpins our interpretations.

While our analysis lags managerial responsiveness to overcome concerns of reverse causality, we nonetheless acknowledge that the level of responsiveness a line manager exhibits is a choice which we neither hypothesize about nor model. It is possible that both managerial responsiveness and speaking up could be driven by a common antecedent, such as higher-quality employees in a given unit. Given the inclusion of hospital-unit fixed effects, we believe this potential source of bias works against our result. This nonetheless should be confirmed in future research, which could develop simultaneous models to explore whether—and, if so, how—employee behaviors and managerial responsiveness simultaneously affect one another. Future research could also leverage exogenous personnel changes, such as maternity leave, to more clearly identify the effects of changes in managerial responsiveness on speaking up, an approach we were unable to pursue due to the anonymity requirements associated with our data.

While our findings suggest that a limited, episodic, but organization-wide process-improvement campaign can encourage speaking up, our empirical context did not enable us to determine the most effective frequency and duration for such a campaign. Research suggests that public information

campaigns benefit from novelty, saturation, and endurance (Flay 1987). If novelty drives salience and thus action, process-improvement campaigns might lose effectiveness if they are run too long or repeated too often. Further research is required to understand how campaign length and frequency affect salience and to understand the conditions under which campaigns promote temporary versus enduring increases in voicing concern, taking charge, and speaking up in general.

Our research sheds light on how organizational-level process-improvement campaigns affect speaking up within the healthcare industry, one of the largest and fastest-growing industries (U.S. Bureau of Labor Statistics 2010) and one that faces serious process-improvement challenges (Kohn et al. 2000). Major hospitals and academic medical centers, being highly complex institutions, are often compared to industries such as aviation that also demand highly reliable results from very complex activities (Gaba 2000, Singer et al. 2010), but it remains unclear to what extent our findings, based on a nonprofit organization in the healthcare industry, are generalizable to for-profit companies in other sectors. We attempted to address this by confirming that our results were consistent after removing incidents that involved patient harm, leaving the more routine operational problems that are likely to be found in any industry. A better understanding of the determinants and outcomes of incident reporting is relevant well beyond the healthcare sector, given that “schemes for reporting near misses, ‘close calls,’ or sentinel (‘warning’) events have [also] been institutionalized in aviation, nuclear power technology, petrochemical processing, steel production, military operations, and air transportation” (Barach and Small 2000: 759). It is also unclear to what extent the relationships identified in our study generalize to organizations that lack incident-reporting systems. Future research could examine how effectively campaigns spur speaking up in organizations that use other systems, such as a fully anonymous formal systems or hotlines (Scott and Rains 2005), informal suggestion boxes (Dowell et al. 2001), or ombudspersons (Arnold and O’Connor 1999). In addition, future research on campaigns could seek to identify key features that drive or impede their effectiveness in spurring speaking up. For example, it would be interesting to consider whether allowing an employee to submit a written report rather than personally approach a manager makes speaking up easier or whether the prospect of creating a formal paper trail is more threatening than face-

to-face speaking up.

Although we explored managerial practices associated with increasing employees' willingness to voice concern and take charge, we did not determine whether the organization we studied actually learned from the information their employees shared, nor did we assess the effectiveness of the managers' or the organization's responses. Future research should assess the extent to which speaking up actually reduces operational problems and, when it does, the precise mechanisms at work.

## CONCLUSION

This study is among the first to develop and empirically test theory about how specific management practices can encourage employees to speak up about operational problems. Our findings provide evidence that (a) process-improvement campaigns prompt employees to speak up, (b) they are particularly effective in encouraging voicing concern, and (c) their effect on taking charge is contingent on prevailing levels of responsiveness by line managers. These results can enable managers to adjust their approaches to soliciting operational improvement ideas from frontline workers. In organizations that can learn from mistakes and anomalies, such information can spark a virtuous cycle of performance improvement.

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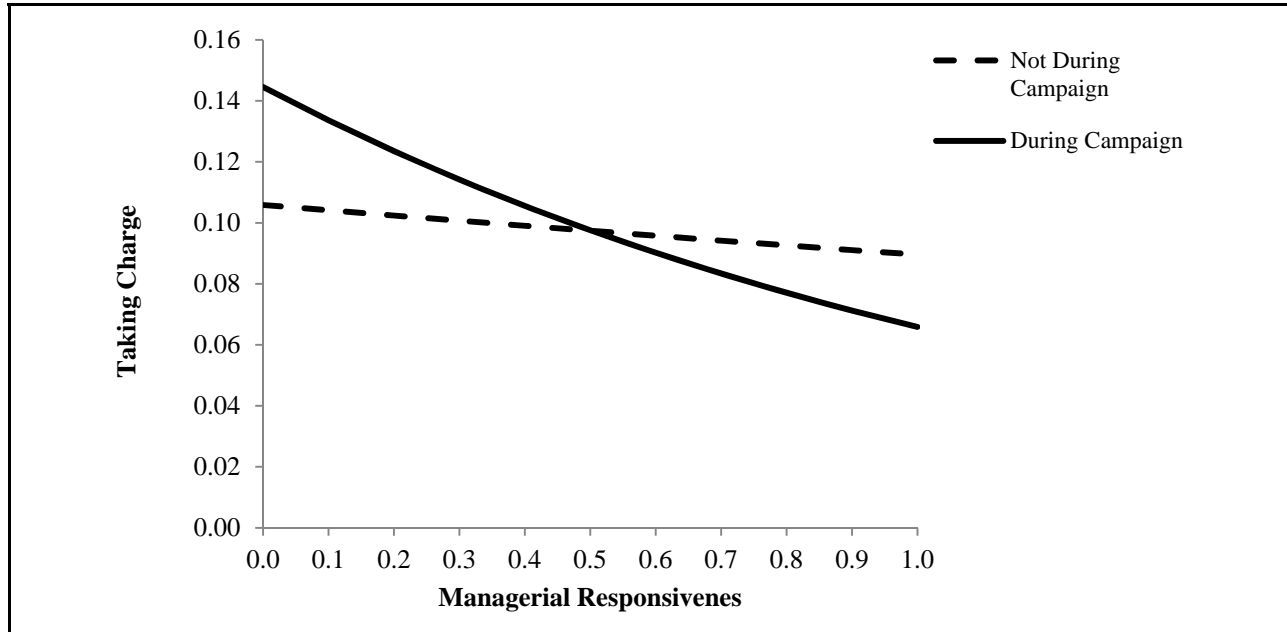
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**Figure 1.**  
**Relationship between Managerial Responsiveness and Taking Charge during and outside Process-Improvement Campaigns**



This figure displays the average predicted weekly number of incident reports with documented actions within each hospital unit in our sample, based on results of a fixed-effects Poisson estimation of Model 5 in Table 2. The 95% confidence intervals (not shown) surrounding the two lines depicted do not overlap when managerial responsiveness ranges from 0% to 20%, but substantially overlap at higher levels of managerial responsiveness. Thus, our results indicate that campaigns increase taking charge in units with low levels of managerial responsiveness, but we find no evidence that campaigns affect taking charge in units with high levels of managerial responsiveness.

**Table 1.**  
**Sample Description**

**Panel A. Summary Statistics**

<b>Variable</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Speaking up	0.50	1.38	0	20
Taking charge	0.10	0.44	0	10
Voicing concern	0.37	1.15	0	18
Process-improvement campaign (dummy)	0.10	0.30	0	1
Managerial responsiveness to process improvement	0.18	0.28	0	1

**Panel B. Correlations**

	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>1</i> Speaking up	1.00				
<i>2</i> Taking charge	0.50	1.00			
<i>3</i> Voicing concern	0.93	0.18	1.00		
<i>4</i> Process-improvement campaign (dummy)	0.02	0.03	0.01	1.00	
<i>5</i> Managerial responsiveness to process improvement	0.01	-0.03	0.03	0.02	1.00

Note: N=19,016 hospital-unit-week observations (from 134 hospital units over 142 weeks).

**Table 2.**  
**Conditional Fixed-Effects Poisson Regression Results**

Model	(1)	(2)	(3)	(4)	(5)
	Speaking up	Voicing concern	Taking charge	Voicing concern	Taking charge
Dependent variable	<i>Number of incident reports</i>	<i>Number of incident reports with problems</i>	<i>Number of incident reports with actions</i>	<i>Number of incident reports with problems</i>	<i>Number of incident reports with actions</i>
Process-improvement campaign	0.153** [0.046]	0.217** [0.067]	-0.113 [0.073]	0.213** [0.083]	-0.038 [0.074]
Managerial responsiveness to process improvement	0.217 [0.171]	0.175 [0.210]	-0.231 [0.302]	0.172 [0.214]	-0.167 [0.304]
Managerial responsiveness to process improvement × Process-improvement campaign				0.017 [0.172]	-0.619+ [0.333]
Observations (hospital-unit-weeks)	19,016	15,164	13,308	15,164	13,308
Hospital units	134	111	95	111	95
Log likelihood	-12,477	-8,743	-3,978	-8,743	-3,976
Model Wald Chi-squared	66.42**	104.24**	25.37**	104.82**	26.97**
Wald test: Process-improvement campaign coefficients equal between Models 2 and 3 (Chi-squared based on seemingly unrelated estimation)			9.32**		

This table reports coefficients from conditional fixed-effects quasi-maximum likelihood Poisson regressions. Brackets contain robust standard errors; \*\* p<0.01, \* p<0.05, + p<0.10. The unit of analysis is the hospital-unit-week. The estimates in Models 2-5 are based on fewer observations because the conditional fixed-effects Poisson model drops hospital units (groups) that lack variation in the number of incident reports with reported actions or problems.

## APPENDIX

This Appendix describes an incident-level model that assesses (a) the impact of process-improvement campaigns on the *probability* that an individual incident report reflects taking charge and (b) whether the increase depends on the level of managerial responsiveness in the reporting employee's units. This analysis offers insight into how the composition of reports changes during campaigns.

### Empirical Model

To assess whether managerial responsiveness moderates the relationship between process-improvement campaigns and the likelihood of employees taking charge when they file an incident report, we estimated the following model with the individual incident report as the unit of analysis:

$$TakingCharge_{i,j,t} = F(Camp_t, MgrResp_{j,t-1to6}, Camp_t \times MgrResp_{j,t-1to6}, Harm_i, Equipment_i, Type_i, Month_t, Year_t, Unit_j)$$

where  $F(\cdot)$  is the logit function. This model estimates the likelihood of an employee documenting an action when reporting incident  $i$  in hospital unit  $j$  on date  $t$  as a function of whether or not the incident occurred during a hospital-wide process-improvement campaign ( $Camp_t$ ), the prevailing level of managerial responsiveness to process improvement in the previous six months in the hospital unit in which the incident occurred ( $MgrResp_{j,t-1to6}$ ), and the interaction between these two variables. These variables are identical to those in the primary analysis.

Because this model is at the incident-report level, we can control for additional factors that can influence the probability of employees documenting actions in their incident reports. We control for actual or potential patient harm as a result of the incident ( $Harm_i$ ) by including dummy variables denoting (a) liability risk due to a patient being involved in the incident, (b) whether the incident involved obstetrics, and (c) whether the incident occurred in a patient or clinical area. We also include a series of dummies indicating whether the incident caused no patient harm, temporary patient harm, permanent patient harm, or patient death. We also include a dummy indicating whether equipment was involved ( $Equipment_i$ ) and a full series of dummies indicating whether the incident type ( $Type_i$ ) was related to

blood or blood products; identification, documentation, or consent; lab specimens or tests; or a surgery or procedure. The “Measures” section below provides more detail on these measures and justification for their inclusion.

We also include a full set of month dummies ( $Month_t$ ), because discussions with our hospital contacts revealed that responses to incidents varied by month. For example, our contacts perceived lower levels of responsiveness during July, August, and December, when many employees take their vacation time. We include a full set of year dummies ( $Year_t$ ) for reasons described above. Finally, we include (conditional) fixed effects at the hospital-unit level ( $Unit_j$ ) to control for unit-specific time-invariant factors, such as the unit’s activities and profitability (Horwitz 2005), that might affect the propensity to document actions taken in an incident report.

## Measures

**Taking Charge in an Incident Report.** Taking charge is the dichotomous outcome variable, coded “1” if the structured list within an incident report documented any actions taken by staff and “0” if it did not.

**Patient Harm.** Not all incident reports involve harm or potential harm to patients and some describe concerns rather than actual incidents. For example, some reported incidents involve wheelchair transportation taking so long that nurses have to make several calls or procedural errors such as excess blood units being wasted because they were not returned promptly to the blood bank. However, incidents that resulted or could have resulted in patient harm carry the risk of malpractice lawsuits (Kessler and McClellan 1996). Not only do incidents that directly involve patients run a greater risk of legal liability, but they are also particularly likely to conflict with a hospital’s mission of providing high-quality patient care. In addition, the notion that patient harm would shape response is consistent with ethical arguments that the moral intensity of an issue influences decision making and behavior (Jones 1991). However, it is also possible that actual or potential harm will motivate employees to voice concern, without necessarily affecting taking charge.

For all these reasons, we created several measures to identify incidents that either harmed or could have harmed patients and therefore might make employees especially likely or unlikely to take charge. We created *patient involved* as a dichotomous variable, coded “1” if the incident reporter populated the “patient age” field, noted in the “severity” field that patient harm had occurred, noted that the incident involved a fall, or reported that the patient was in pain; and “0” otherwise. We also created *patient or clinical area* as a dichotomous variable, coded “1” when an incident occurred in a unit, patient room, or treatment area, and “0” when it occurred elsewhere (e.g., in a public area such as a hallway or cafeteria). To capture varying levels of patient harm, we created four dichotomous variables pulled directly from fields in the incident report: *patient death*, *permanent patient harm*, *temporary patient harm*, and *low severity*, the latter referring to near misses and to incidents that did not result in patient harm. Finally, we identified incidents associated with obstetrics because malpractice claims are especially likely in this practice area (Kim 2007, Rodwin et al. 2008, Studdert et al. 2006). We created *obstetrics* as a dichotomous variable, coded “1” for incidents that took place in the obstetrics ward, the nursery, or a neonatal intensive care unit (NICU); incidents for which the patient was admitted for newborn, newborn specialty, or obstetrics care; incidents involving a patient less than one month old; and incidents classified as maternal/childbirth; and “0” otherwise.

**Equipment.** Incidents involving equipment may influence the extent to which an employee takes charge because he or she may not be in a position to repair or replace the equipment. We created *equipment* as a dichotomous variable, coded “1” when the incident reporter indicated that equipment was involved and “0” otherwise.

Summary statistics and correlations of these variables are provided in Table A-1.

## Results

We used conditional fixed-effects logistic regression to estimate the model that predicts the

probability that a particular incident report will contain documented actions, a dichotomous variable.<sup>10</sup> The results, reported in Table A-2, reflect a substitution effect, as shown by the negative and statistically significant coefficient on the interaction term (Model 2:  $\beta=-1.07$ ,  $p<0.05$ ). In this model, the average marginal effect reveals that process-improvement campaigns increase the probability that an incident report would include taking charge by 7.3 percentage points, a substantial increase beyond the average probability of 30.6% within the sample. However, this effect is moderated by the level of managerial responsiveness. The moderation relationship is depicted in Figure A-1, which graphs the average predicted probability that an incident report will include documented actions across various levels of managerial responsiveness, both during and outside of information-campaign periods. In contrast to the relatively flat line indicating that reporting taking charge within incident reports is largely insensitive to managerial responsiveness outside of campaign periods, managerial responsiveness influences the likelihood of taking charge during campaign periods. In units with lower levels of managerial responsiveness, incident reports are more likely to reflect taking charge during campaign periods. Levels of taking charge significantly differed between campaign and non-campaign periods in units with low managerial responsiveness; the 95% confidence intervals surrounding the lines depicted in Figure A-1 do not overlap for managerial responsiveness levels ranging from 0% to 20%. While the figure seems to suggest that units with higher levels of managerial responsiveness exhibit lower levels of taking charge during campaign periods, the confidence intervals overlap substantially over this higher range of managerial responsiveness, indicating that these differences are not statistically significant. These results are consistent with our primary finding that process-improvement campaigns serve as a substitute for low levels of managerial responsiveness in increasing the frequency of taking charge (H3b).

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<sup>10</sup> This conditional fixed-effects logistic regression model failed to converge until we reassigned a random half of the observations in the most populous location code to a new location code. To ensure that this particular reassignment was not driving our results, we replicated this process 100 times for each model; the results were nearly identical.



**Table A-1.**  
**Sample Description for Incident-Report-Level Analysis**

**Panel A. Summary Statistics**

<b>Variable</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Taking charge	0.31	0.46	0	1
Process-improvement campaign	0.14	0.35	0	1
Managerial responsiveness to process improvement	0.20	0.27	0	1
Harm – patient present	0.89	0.31	0	1
Harm – patient or clinical area	0.11	0.31	0	1
Harm – temporary	0.03	0.18	0	1
Harm – permanent	0.00	0.05	0	1
Harm – death	0.00	0.03	0	1
Harm – obstetrics	0.09	0.29	0	1
Equipment involved	0.04	0.21	0	1

**Panel B. Correlations**

	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
<i>1</i> Taking charge	1.00								
<i>2</i> Process-improvement campaign	0.07	1.00							
<i>3</i> Managerial responsiveness to process improvement	-0.11	0.00	1.00						
<i>4</i> Harm – patient present	0.10	0.00	0.11	1.00					
<i>5</i> Harm – patient or clinical area	0.11	0.00	-0.11	-0.02	1.00				
<i>6</i> Harm – temporary	0.00	-0.01	-0.04	0.06	0.16	1.00			
<i>7</i> Harm – permanent	0.01	-0.01	-0.01	0.02	0.06	-0.01	1.00		
<i>8</i> Harm – death	0.02	-0.01	-0.01	0.01	0.03	0.00	0.00	1.00	
<i>9</i> Harm – obstetrics	0.07	-0.01	-0.17	0.02	-0.04	0.00	0.00	-0.01	1.00
<i>10</i> Equipment involved	0.01	0.00	-0.09	-0.16	0.25	0.10	0.02	-0.01	-0.04

**Panel C. Frequency of Incident Types in Sample**

<b>Incident type</b>	<b>Percent of incidents of this type</b>
Blood/blood product	36%
ID/documentation/consent	10%
Lab specimen/test	39%
Surgery/procedure	15%

Notes: N=8,483 incident reports (Panels A-C). All except *managerial responsiveness to process improvement* are dummy variables.

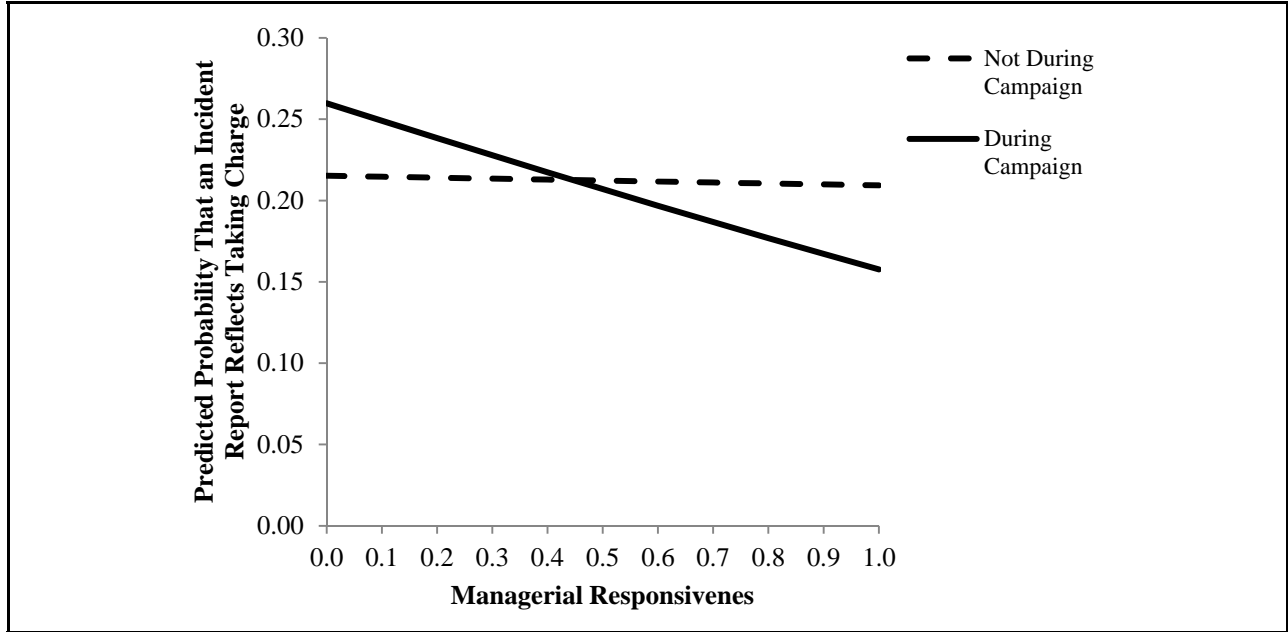
**Table A-2.**  
**Conditional Fixed-Effects Logistic Regression Results**

**Dependent Variable: Taking Charge**

	Coefficients	Coefficients
Process-improvement campaign	0.821** [0.219]	0.973** [0.244]
Managerial responsiveness to process improvement	-0.203 [0.459]	-0.078 [0.479]
Managerial responsiveness to process improvement × Process-improvement campaign		-1.074* [0.475]
Harm - patient present	1.007** [0.252]	1.009** [0.253]
Harm - patient or clinical area	0.743* [0.338]	0.745* [0.339]
Harm – temporary	0.118 [0.200]	0.115 [0.201]
Harm – permanent	0.373 [0.713]	0.366 [0.726]
Harm – death	-0.342 [0.783]	-0.343 [0.791]
Harm – obstetrics	0.293 [0.198]	0.292 [0.195]
Equipment involved	-0.003 [0.135]	0.002 [0.134]
Hospital-unit (conditional) fixed effects	Included	Included
Incident-type fixed effects	Included	Included
Month fixed effects	Included	Included
Year fixed effects	Included	Included
Observations (incident reports)	8,483	8,483
Hospital units	90	90
Log likelihood	-2,186	-2,184
Model Wald Chi-squared	1553**	1592**
McFadden’s R-squared	0.47	0.47

This table displays results of a conditional fixed-effects logistic regression model. Brackets contain robust standard errors; \*\* p<0.01, \* p<0.05, + p<0.10. The unit of analysis is the incident report. The model also includes a dummy variable (*area unreported*) designating incident reports that did not indicate where the incident occurred. This conditional fixed-effects logistic model dropped 44 hospital units (groups), accounting for 80 incident reports (observations), because these units lacked outcome variation (e.g., no reports included documented actions during our sample period).

**Figure A-1.**  
**Relationship between Managerial Responsiveness and the Probability of Taking Charge within an Incident Report during and outside Process-Improvement Campaigns**



This figure displays the predicted probability that an incident report will contain one or more documented actions, based on the results of a fixed-effects logistic estimation of Model 2 in Table A-2. The 95% confidence intervals surrounding the two lines depicted do not overlap when managerial responsiveness ranges from 0% and 20%, but substantially overlap at higher levels of managerial responsiveness. Thus, our results indicate that campaigns increase the probability that reports will reflect taking charge in units with low levels of managerial responsiveness, but we find no evidence that campaigns affect this probability in units with high levels of managerial responsiveness.