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The influence of organizational factors on patient safety: Examining successful handoffs in health care

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Abstract

Background—Although patient handoffs have been extensively studied, they continue to be problematic. Studies have shown poor handoffs are associated with increased costs, morbidity, and mortality. No prior research compared perceptions of management and clinical staff regarding handoffs.

Purpose—Our aims were (a) to determine whether perceptions of organizational factors that can influence patient safety are positively associated with perceptions of successful patient handoffs, (b) to identify organizational factors that have the greatest influence on perceptions of successful handoffs, and (c) to determine whether associations between perceptions of these factors and successful handoffs differ for management and clinical staff.

Methodology/Approach—A total of 515,637 respondents from 1,052 hospitals completed the Hospital Survey on Patient Safety Culture that assessed perceptions about organizational factors that influence patient safety. Using weighted least squares multiple regression, we tested seven organizational factors as predictors of successful handoffs. We fit three separate models using data collected from (a) all staff, (b) management only, and (c) clinical staff only.

Findings—We found that perceived teamwork across units was the most significant predictor of perceived successful handoffs. Perceptions of staffing and management support for safety were also significantly associated with perceived successful handoffs for both management and clinical staff. For management respondents, perceptions of organizational learning or continuous improvement had a significant positive association with perceived successful handoffs, whereas the association was negative for clinical staff. Perceived communication openness had a significant association only among clinical staff.

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Practice Implications—Hospitals should prioritize teamwork across units and strive to improve communication across the organization in efforts to improve handoffs. In addition, hospitals should ensure sufficient staffing and management support for patient safety. Different perceptions between management and clinical staff with respect to the importance of organizational learning are noteworthy and merit additional study.

Keywords

handoffs; hospitals; management; patient safety; quality improvement; safety culture

Patient handoffs have received increased attention in recent years because of their important role in patient safety. Defined as the transfer of patient rights, duties, and obligations from one person or team to another, handoffs can occur both within units of a hospital or across units or organizational settings. Poor patient handoffs are associated with increased medical errors as well as treatment delays, increased malpractice risk, and repetitive testing (Greenberg et al., 2007; Kohn, Corrigan, & Donaldson, 1999). Furthermore, a study of three emergency departments found that 8.8% of doctors and 4.7% of patients were affected by an inadequate handoff, as measured by repetition of assessment and delays in disposition and care (Ye, Taylor, Knott, Dent, & MacBean, 2007).

Physician specialization and policy changes, including duty hour restrictions for residents and 24-hour physician coverage, have increased the number of patient handoffs over the past 10–15 years. This heightened number of handoffs, in turn, has contributed to greater fragmentation and discontinuity of care (Philibert & Leach, 2005). As a result, health outcomes have been adversely affected. A recent study of hospitalists found that a 10% increase in fragmentation of care was associated with an increased length of stay of 0.39 day for pneumonia and 0.30 day for heart failure (Epstein, Juarez, Epstein, Loya, & Singer, 2010).

We conducted this study to determine whether perceived organizational factors that may influence patient safety are positively associated with perceived successful patient handoffs to identify organizational factors with the greatest effect on perceived successful handoffs and to determine whether associations between perceptions about organizational factors and successful handoffs differ for management and clinical staff. The primary purpose of our study was to provide insight about how health care organizations can improve the percentage of successful handoffs, focusing on organizational factors that can influence patient safety.

New Contribution

This study adds four elements to existing literature on patient handoffs. First, it models seven oft-cited organizational factors that have been associated with handoffs to identify those most critical. Although other studies provided insights into factors associated with handoffs, they did not test the factors collectively nor identify those of greatest importance using inferential statistics. The closure of this gap is highly relevant given hospital resource constraints and the tradeoffs between patient safety and the costs involved in addressing patient safety concerns.

Second, this analysis examined the differences in perceptions of management and clinical staff. No quantitative study looked at differences in survey responses between management and clinical staff to determine whether associations between perceptions about organizational factors and patient handoffs differ between the two groups. Given that management controls resources and indirectly influences patient safety but clinical staff directly influences safety through patient interactions, it is important to consider differences in these perspectives to improve our understanding about how to improve overall patient safety.

Third, this research examines a large national sample of hospitals, and this approach is in contrast to prior studies that have used small quantitative samples or qualitative methods. Our use of a large national sample enabled us to use multiple linear regression and overcome the limitations of other studies that have examined handoffs primarily using descriptive methods. The expanded scope of our study presents an opportunity to confirm findings from previous qualitative and small quantitative studies and to generalize results to U.S. hospitals.

Fourth, this study has practical implications because it uses data available from a free survey that is in use at more than 1,000 hospitals. Hospitals using this survey do not need to survey additional staff to gather information about perceptions of safety but instead can immediately apply our findings to safety improvement efforts in their organizations.

Finally, although our study had several hypotheses, it was also exploratory because it aimed to identify the organizational factors most highly associated with perceived successful handoffs. Prior studies have not used inferential statistics to identify the variable with the greatest effect.

Theory/Conceptual Framework

Vogus, Sutcliffe, and Weick (2010) contend that implementing a safety culture has three phases—*enabling*, *enacting*, and *elaborating*—with each comprised of actions that influence patient safety and care outcomes. First, the *enabling phase* centers on leader actions that direct attention to patient safety and make it safe to speak up and act in ways that improve safety. In this stage, leaders create an environment for staff to safely communicate when faced with threats to patient safety. Next, the *enacting phase* involves frontline staff actions that highlight threats to safety and mobilize resources to reduce those threats. If enacting characteristics are strong, resources can be quickly mobilized and effectively used to resolve threats to safety. Finally, the *elaborating phase* consists of learning practices that enable reflection about safety outcomes to modify actions involved in the enabling and enacting phases. In the elaborating stage, frontline employees reflect on problems in order to evolve and expand safety practices. This stage also has potential to strengthen enabling and enacting actions when recommendations from the elaborating phase are communicated to management.

We adapted the model to frame our study, as shown in Figure 1, and then fit the survey data available in the Hospital Survey on Patient Safety Culture (HSOPS) data set within this conceptual model. The enabling stage contains the predictor variables of management

support, supervisor support, communication openness, and staffing levels from the HSOPS survey. Next, the enacting stage includes teamwork within units and teamwork across units as variables from the HSOPS survey. Finally, the elaborating stage of the framework includes the organizational learning variable that is described in the independent variables section of this article.

Hypotheses

Reviews of physician and nurse literature suggest that various factors such as communication failures, hierarchy, lack of leadership focus on safety, staffing shortages, and lack of formal handoff education are barriers to successful handoffs (Riesenberg et al., 2009; Riesenberg, Leisch, & Cunningham, 2010). Given those findings and our adapted conceptual model, we framed Hypothesis 1 for our study as follows:

Hypothesis 1: Higher levels of perceived organizational factors of safety are associated with perceptions of successful patient handoffs.

Although we found no study that compares management and clinical staff perspectives about the organizational factors of safety using inferential statistics, a study of 29 acute care hospitals in West Virginia that examined differences in perceptions found management had higher mean perceptions of positive patient safety than nurses in 11 of the 12 measures of safety culture studied (Hannah, Schade, Lomely, Ruddick, & Bellamy 2008). Therefore, we proposed the following as our second study hypothesis:

Hypothesis 2: Associations between perceptions of organizational factors of safety and successful handoffs differ depending on whether the responses were from management or clinical staff.

Methods

Data and Sample

The data source for this study was the Agency for Healthcare Research and Quality's HSOPS comparative database. This database is a central repository for survey data from hospitals in all 50 states plus U.S. territories that have administered the HSOPS survey. The HSOPS survey has been shown to be a reliable survey instrument that can be studied at multiple levels of analysis. Psychometric analyses conducted by multiple studies confirmed that the HSOPS dimensions, each comprised of three to four survey questions, are reliable measures valid at the individual, unit, and hospital levels and can be used by researchers to assess patient safety culture (Sorra & Dyer, 2010). The survey instrument and the survey questions that comprise each dimension can be found at www.ahrq.gov/professionals/quality-patient-safety/patientsafetyculture/hospital/index.html.

Our study data set incorporated surveys completed by hospital staff from 2008 to 2011, with survey data aggregated to the hospital level. Although each individual hospital does not administer the HSOPS survey annually, hospital participants are able to submit data annually for a range of 1–4 years. We used data from prior years only when a hospital did not submit new data; in other cases, we used more recent annual data to replace older data. We chose the hospital as the unit of analysis because it allowed us to group staff that had similar

experiences and give interpretations based on organizational factors influencing safety for the entire hospital. Furthermore, even though there is significant clustering of responses at the hospital level, Smits, Wagner, Spreeuwenberg, Goenewegen, and Van Der Wal (2009) confirmed that the HSOPS survey can measure group culture and not solely individual attitudes, thus enabling us to use these data to test our study hypotheses.

A total of 1,081 hospitals contributed to the data set used for this study. Of those, 29 hospitals were removed because of missing data, leaving a final study sample of 1,052 hospitals and 515,637 individual-level responses. The characteristics of the hospitals in this final sample were consistent with the overall distribution of hospitals registered with the American Hospital Association with respect to teaching status, ownership, geographic region, and bed size.

In addition, a total of 1,047 hospitals from this data set had responses for both managers (36,290 respondents) and clinical staff (237,409). We used this data set to compare perspectives between management and clinical staff across survey items. On the survey, employees provided one answer that best described their staff position in the hospital. We defined clinical staff as those that selected physician, physician assistant, nurse practitioner, registered nurse, licensed practical nurse, or medical assistant. The management group was comprised of staff that selected administration/management. For management and clinical staff comparisons, management and clinical staff responses were distinctly aggregated to the hospital level.

Measures

The HSOPS survey used a 5-point Likert scale with the response choices of *strongly disagree*, *disagree*, *neither agree nor disagree*, *agree*, or *strongly agree* for most questions. Some questions had the alternative 5-point response options of *never*, *rarely*, *sometimes*, *most of the time*, or *always*. If questions were positively worded, responses were considered positive if the person “agreed” or “strongly agreed”; if the questions were negatively worded, the responses “disagreed” or “strongly disagreed” were considered positive.

We calculated percent positive scores for the three to four related questions that comprised each variable based on averaged responses for participants from each individual hospital. These averaged scores became the values for the dependent and independent variables. Percent positive scores had a possible range of 0–100. We used the percent positive score instead of the 5-point Likert scale mean to improve interpretability of study results.

Independent Variables

The predictor variables of interest for our study included respondents’ perceptions about the following organizational factors that could influence patient safety: supervisor support for safety, organizational learning, teamwork within units, communication openness, management support for patient safety, staffing levels, and teamwork across units. *Supervisor support* indicated the priority a supervisor placed on safety. *Organizational learning* reflected continuous improvement regarding patient safety, in which mistakes led to positive changes and improvements were evaluated for their effectiveness. *Teamwork within units* exhibited the support and respect that people have for one another within a unit.

Communication openness was the comfort level of staff to question those with more authority when something did not seem right. *Management support* was the prioritization and interest hospital management placed on safety. *Staffing* conveyed whether there was enough staff to appropriately handle patient care. *Teamwork across units* examined the coordination of patient care from one unit to another. We also included control variables for each hospital. These control variables included *bed size*, *region*, *teaching hospital status*, and *government ownership status* (Table 1).

Dependent Variable

The dependent variable of interest in our study was *successful handoffs*. The survey specifically asked respondents to think about handoffs within their hospital and not handoffs to external facilities. This variable was defined based on perceptions of how well patient information was relayed on patient transfers to different units within the hospital and the effect of shift changes on patient information transfer. The complete questions, all negatively worded, used to generate the dependent variable included the following: (a) things fall between the cracks when transferring patients from one unit to another, (b) important patient care information is often lost during shift changes, (c) problems often occur in the exchange of information across hospital units, and (d) shift changes are problematic for patients in this hospital.

Procedures

We used weighted least squares multiple linear regression analysis to examine the association between perceptions about the organizational factors of interest in our study and perceptions about successful handoffs. We calculated weights by dividing the number of hospital respondents by the number surveyed to reflect that the quality of hospital means should increase with the hospital response rate. All statistical analyses were performed using Stata: Release 11 software (StataCorp LP, College Station, TX).

Findings

We found striking results about perceptions of the effect of teamwork across units and its contribution to perceptions of successful handoffs, as well as about the importance of management support and staffing, and of differences between management and clinical staff. We also found support for our adapted conceptual model. In addition, although we found only partial support for Hypothesis 1, Hypothesis 2 was fully supported, suggesting that associations between perceptions of organizational factors and perceptions of successful handoffs differ based on respondent type. Below we describe these findings in greater detail.

Our first hypothesis, that higher levels of perceived organizational factors of safety are associated with perceptions of successful patient handoffs, was partially supported by the linear regression analysis. Among the organizational factors we studied, teamwork across units had the largest effect on perceived successful handoffs in terms of both beta coefficient and R-square ($\beta = .83$, 95% CI [0.77, 0.89], $p < .001$). Perceptions of teamwork across units explained 44% of the variability in perceived successful handoffs left unexplained by all other organizational factors, controlling for bed size, region, teaching hospital status, and

government ownership status (Table 2). In contrast to perceived teamwork across units, perceived teamwork within units was negatively associated with perceived successful handoffs ($\beta = -.19$, 95% CI $[-0.27, -0.10]$, $p < .001$). Organizational learning ($\beta = .15$, 95% CI $[0.07, 0.23]$, $p < .001$) and staffing ($\beta = .07$, 95% CI $[0.18, 0.28]$, $p < .001$) each had significant positive effects on perceived successful handoffs when we analyzed aggregate data of all hospital staff. The model adjusted R-square with all independent variables was .83, whereas the adjusted R-square for the model with only control variables was .31. Thus, the perceived organizational factors of safety explained a considerable amount of variation in perceived successful handoffs, beyond that explained by the control variables.

Our second hypothesis, that associations between perceived organizational factors of safety and perceived successful handoffs differ depending on respondent group, was fully supported by our analyses. As shown in Table 3, for each organizational factor studied, managers averaged higher positive perceptions of these factors than did clinical staff. Mean differences ranged from 8.7% to 18.2%. All differences were highly statistically significant ($p < .001$), based on a paired t test.

When comparing management and clinical staff perceptions of successful handoffs based on the possible influence of different organizational factors, we found the association with organizational learning differed between the two groups, whereas the associations with teamwork, staffing, and management support were similar (Table 4). Although analysis of all staff perceptions indicated that organizational learning was significantly associated with perceived successful handoffs, this subgroup analysis revealed that the association was not true of all staff. Holding the other organizational factors constant, organizational learning had a positive association with perceived successful patient handoffs for management respondents, whereas the association was negative for clinical staff respondents.

The association of perceived teamwork across units with successful handoffs was again the largest among all organizational factors studied and was comparable in the separate linear regressions for clinical ($\beta = .68$, 95% CI $[0.63, 0.73]$, $p < .001$) and management staff ($\beta = .69$, 95% CI $[0.63, 0.75]$, $p < .001$). Meanwhile, the association between perceived teamwork within units and perceived successful handoffs was similarly negative in the clinical ($\beta = -.11$, 95% CI $[-0.18, -0.04]$, $p < .01$) and management staff ($\beta = -.15$, 95% CI $[-0.27, -0.04]$, $p < .01$) models.

The staffing and management support for safety variables had a significant positive association with perceived successful handoffs in analyses of both management and clinical staff responses, thereby adding credence to their importance. Staffing had a positive association with perceived successful handoffs in the analysis of manager responses ($\beta = .21$, 95% CI $[0.15, 0.28]$, $p < .001$) and of clinical staff responses ($\beta = .18$, 95% CI $[0.13, 0.22]$, $p < .001$). Similarly, perceived management support for safety had a positive association with perceived successful handoffs in the analysis of manager responses ($\beta = .10$, 95% CI $[0.01, 0.18]$, $p < .05$) as well as the analysis of clinical staff responses ($\beta = .11$, 95% CI $[0.04, 0.17]$, $p < .01$).

Our study also provides support for our adapted conceptual model that enabling, enacting, and elaborating actions can influence patient safety. We found that each stage of this model had at least one factor that was statistically significantly associated with perceived successful patient handoffs. First, when analyzing responses from all respondents, we found that one of the four activities we classified as *enabling*—staffing—was significantly associated with perceptions of successful handoffs. Furthermore, in subgroup analyses of management and clinical staff responses, we found significant associations between management support for safety and perceived successful handoffs. The activities we classified as *enacting* exhibited the strongest associations with perceptions of successful handoffs. We found that for all staff as well as for the management and clinical staff subgroups, perceived teamwork across units had the strongest association with perceived successful handoffs. Finally, the activity we classified as *elaborating*, organizational learning, was also significantly associated with perceptions of successful handoffs.

Discussion

Despite the efforts of hospital leaders, poor patient handoffs continue to result in adverse patient health outcomes and unnecessary costs (Greenberg et al., 2007). Considering the unfavorable impact that poor handoffs have on patient health, handoffs should be a patient safety priority for hospitals. However, strong consensus has been lacking as to which and how much organizational factors influence successful handoffs.

Results of our study provide insight into relationships between perceptions of patient handoffs and organizational factors that influence them. In general, as a hospital was perceived more favorably with regard to the organizational factors that contribute to patient safety, perceptions of its handoffs were better as well. Our analysis confirmed the results of prior small qualitative and quantitative studies involving nurses and physicians that have suggested that communication failures, hierarchy, lack of leadership focus on safety, and staffing shortages are barriers to successful handoffs (Riesenberg et al., 2009, 2010). Furthermore, because the adapted conceptual model we used to frame our study was supported by our data, we suggest that this model may have relevance for future studies that aim to examine other patient safety topics.

Impact of Teamwork and Communication Openness

We found that perceived teamwork across units had the strongest association with perceived successful handoffs and note that this relationship was consistent for both management and clinical staff. Given that only a fraction of recommended patient safety improvements can be typically adopted by a hospital because of constraints on finances and staffing (Warburton, 2005), improving our understanding about the degree to which various organizational factors may influence successful patient handoffs is clearly important. The results of our study suggest that attention be paid to actions that prioritize improvements in teamwork across units. Those actions and the benefits of them should be well communicated to staff so that their perceptions about teamwork change. Improvement in this area will be challenging because it will involve multiple hospital units; one manager does not have the unilateral ability to make all improvements. However, Manser (2009) showed that staff perceptions of

teamwork are directly related to the quality and safety of patient care; the results of our study provide additional evidence about the importance of perceptions of teamwork on handoffs, thus highlighting the need to address this issue.

Communication openness, or the comfort level staff have to question authority if something is not right, was perceived as having an impact on handoffs by the clinical staff, but not by management. This finding is important because managers are often responsible for creating initiatives designed to improve communications. Managers must be cognizant of the impact open communications have on successful handoffs in the minds of the clinical staff who actually hand off patients.

Several actions have been identified in the literature that can foster improved teamwork and communication openness. Examples include teamwork training, use of team huddles, interdisciplinary rounds, and the introduction of focus groups designed to identify teamwork issues (Farley, Sorbero, Lovejoy, & Salisbury, 2010; Kalisch, Curley, & Stefanov, 2007; O'Leary et al., 2010). Teamwork training at medical facilities is particularly important in light of the finding that only 8% of medical schools teach physicians how to properly hand off patients (Solet, Norvell, Rutan, & Frankel, 2004). Importantly, teamwork training can be conducted to improve teamwork across units and is associated with improved clinical outcomes. Blegen et al. (2010) found that multidisciplinary teamwork training significantly improved perceived teamwork across units. Similarly, one study of emergency departments found that teamwork training led to fewer clinical errors (Barrett, Gifford, Morey, Risser, & Salisbury, 2001).

Although the negative association between teamwork within units and perceived successful handoffs was unexpected, there is a plausible explanation in the overall context of teamwork. It is possible that, when holding teamwork across units constant, the strengthening of teamwork within units led staff to perceive that a handoff was more likely to be unsuccessful if made to a unit thought to have lower standards for patient safety.

Role of Staffing and Management Support

Findings from our study also suggest that staffing and management support for safety impact perceptions about successful handoffs. In practice, an adequate number of staff is essential for patient information transfer from one hospital unit to another, and the significance of staffing in our study seems to corroborate those findings. Previous studies suggested that insufficient time was a barrier to successful handoffs (Riesenberg et al., 2009, 2010), and lower staffing levels may contribute to staffs' perceptions about sufficient time. At the same time, although we suggest that increased staffing can improve handoffs, in some hospitals it may be difficult to implement such a strategy given the financial requirements of such a recommendation (May, Bazzoli, & Gerland, 2006).

Management support for safety was another factor that influenced perceived successful handoffs, and this was true among both management and clinical staff respondents. In order to increase management support, one approach may be to implement a safety board with safety subcommittees (Wong, Helsinger, & Petry, 2002). Another approach would be to include an evaluation of safety performance as part of the annual performance appraisal

process for managers. Furthermore, as previously noted, managers can demonstrate support through the implementation of teamwork training programs or by convening focus groups to examine ways to improve teamwork.

Differences in Perceptions Between Management and Clinical Staff on Organizational Learning

Our comparison between management and clinical staff respondent groups highlighted some important differences in organizational learning. Such differences are relevant because, although management may control resources and indirectly influence patient safety, clinical staff directly influences patient safety through interactions with patients. It is possible that organizational learning can lead to more successful handoffs, but management may not share what is learned with clinical staff. Therefore, clinical staff may incorrectly perceive minimal benefit to the learning or improvement activities. It is also possible that learning activities are assumed by management to have a positive impact when in actuality that is not true. A third possible explanation is that continuous improvement activities lead to changes that reduce financial and operational costs from handoffs, and these impacts are observed by management. Yet, they do not positively impact the clinical status of patients, the impacts of which are observed by clinical staff. The idea that managers generally prioritize results through an operational lens whereas clinicians use a patient lens provides a fourth possible explanation for the different associations between perceptions of organizational learning and successful handoffs. Methods such as feedback, safety rounds, and video reflexive ethnography have been shown to improve organizational learning (Campbell & Thompson, 2007; Carroll, Iedema, & Kerridge, 2008), but further research should be undertaken to move beyond perceptions and determine how learning activities affect successful handoffs.

Limitations and Suggestions for Future Research

Common method bias, the degree to which correlations are altered because of a methods effect, is a potential problem in survey research and may appear when there is simultaneous measurement of predictor and outcome variables. We assessed common method bias with Harman's single factor test and a confirmatory factor analysis, consistent with approaches used by other studies in the literature (Schoenherr & Swink, 2012). These assessments indicated that common method bias was not a significant threat to the validity of our findings; specifically, the single factor model was a worse fit than the proposed model with the differentiated measurement items ($\chi^2 = 3005.697$, $df=135$, $RMSEA = 0.142$, $CFI = 0.494$, $TLI = 0.427$). Consistent with Richardson, Simmering, and Sturman (2009), in our study, common method bias was partially controlled by the design of the survey instrument: reverse-coded questions, spatial separation of dependent and independent variables, question order randomization, and survey respondent anonymity. Our survey instrument included varied questions, with some positively and others negatively worded, and different response options for some of the questions.

Another possible limitation of this study is that the responses are based on perceptions. Answers may reflect what respondents think is happening, but the reality may be very different. However, a multitude of studies suggests a strong link between perceptions of safety culture and safety outcomes (Katz-Navon, Naveh, & Stern, 2005; Mardon, Khanna,

Sorra, Dyer, & Famolaro, 2010), lending support to our approach. Furthermore, research in other disciplines, such as environmental reporting, has shown a relationship between perceptions and reality (Cormier, Gordon, & Magnan, 2004).

A third limitation involves the sampling method and generalizability of results. Our study was based on responses from what was essentially a convenience sample of hospitals that voluntarily submitted data and not from a randomly selected sample of all U.S. hospitals. Nonetheless, our large sample size and our finding that structural characteristics of the database hospitals were similar to characteristics of the distribution of hospitals registered with the AHA give us confidence that these results may be similar across other U.S. hospitals.

There are several paths for future studies. Because the adapted conceptual model was supported by findings from our study, this model may have relevance in future studies designed to examine other patient safety topics. In addition, future research can provide insights into the optimal way to improve teamwork across units in the context of patient safety. Future studies can also test the effect of technology and standardization in the context of teamwork across units and examine whether those factors modify the association of teamwork and handoffs. Furthermore, a future study should also be considered to clarify the role of organizational learning.

Practice Implications

Poor patient handoffs result in adverse medical and financial consequences but can be improved through targeted efforts to improve patient safety. We found that perceptions of successful patient handoffs can be influenced by perceptions of organizational factors such as teamwork, having hospital leadership demonstrate that safety is a priority, and sufficient staffing. Hospitals concerned about patient handoffs should rank improvements in teamwork across units as a top priority and consider initiatives that foster open communications, such as teamwork training. Sufficient staffing should also be provided, recognizing that resource constraints may limit some organizations' abilities to add staff. Finally, leadership should demonstrate support for safety. Methods to demonstrate support include the formation of a safety committee and an evaluation of safety performance as part of a manager's annual performance appraisal.

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Figure 1.
Conceptual model

Table 1

Respondent demographics and summary statistics for organizational factors contributing to safety culture

	<i>n</i>	Mean <i>SD</i>
Respondent demographics ^a :		
Nurse (RN, LPN, LVN)	173,296	34
Other	100,914	20
Technician (EKG, Lab, Radiology)	52,730	10
Administration/management	37,296	7
Unit assistant/clerk/secretary	31,631	6
Physician, physician assistant, nurse practitioner	28,363	6
Patient care assistant/hospital aide/care partner	27,026	5
Therapist (respiratory, physical, occupational, speech)	24,021	5
Pharmacist	9,600	2
Dietician	5,156	1
Missing demographic information	25,604	5
Organizational factors contributing to safety culture ^b :		
Successful handoffs	59	7.6
Supervisor support	75	6.4
Organizational learning	72	7.1
Teamwork within units	80	5.7
Communication openness	62	6.5
Staffing levels	57	9.1
Management support	72	9.3
Teamwork across units	59	10.0

N = 1,052 hospitals; 515,637 staff.^aMean reflects percentage of total respondents that belong to a specific staff group.^bMean reflects the average percentage of respondents at each hospital that agreed or strongly agreed to survey questions; responses were based on 5-point Likert scale.

Table 2

Weighted least squares multiple regression of successful handoffs on different organizational factors

Organizational Factor	Partial R^2	β	95% CI
Supervisor support	<.01	.02	(-0.07, 0.11)
Organizational learning	.01	.15	(0.07, 0.23) ***
Teamwork within units	.02	-.19	(-0.27, -0.10) ***
Communication openness	<.01	-.01	(-0.08, 0.06)
Staffing	.07	.23	(0.18, 0.28) ***
Management support	<.01	-.04	(-0.11, 0.03)
Teamwork across units	.44	.83	(0.77, 0.89) ***

Included all hospital staff responses; weight was a hospital's response rate; $N = 1,052$.

Controls included teaching hospital, government hospital, bed size, and region.

R^2 was .83 for full model; R^2 was .31 for control variables only.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Organizational factors that may influence successful handoffs: Comparing management and clinical staff perceptions

Organizational factor	Management ^a mean	Clinical ^b mean	Difference	Significance (<i>t</i> Test)
Supervisor support for safety	86.3	73.2	13.1	***
Organizational learning	84.3	72.1	12.2	***
Teamwork within units	89.4	79.9	9.5	***
Communication openness	77.5	60.0	17.5	***
Staffing levels	66.0	57.3	8.7	***
Management support for safety	85.8	67.6	18.2	***
Teamwork across units	68.0	57.0	11.0	***

Values reflect the average percentage of people at each hospital that agreed or strongly agreed with the questions that related to the variable of interest; *N* = 1,047 hospitals.

Question responses were based on a 5-point Likert scale.

^aManagement consists of hospital staff that selected their primary staff position as administration/management.

^bClinical staff consists of physicians, physician assistants, nurse practitioners, registered nurses, licensed practical nurses, and medical assistants.

* *p* < .05.

** *p* < .01.

*** *p* < .001.

Table 4

Weighted least squares multiple regression of successful handoffs on organizational factors: Comparing management and clinical staff models

Organizational Factor	Management ^a		Clinical Staff ^b	
	β	95% CI	β	95% CI
Supervisor support	-.06	(-0.17, 0.04)	.01	(-0.06, 0.08)
Organizational learning	.20	(0.10, 0.29)	***	(-0.15, -0.01) *
Teamwork within units	-.15	(-0.27, -0.04)	**	(-0.18, -0.04) **
Communication openness	.02	(-0.05, 0.10)	.13	(0.07, 0.20) ***
Staffing	.21	(0.15, 0.28)	***	(0.13, 0.22) ***
Management support	.10	(0.01, 0.18)	*	(0.04, 0.17) **
Teamwork across units	.69	(0.63, 0.75)	***	(0.63, 0.73) ***

Weight was hospital's overall response rate; $N = 1,047$ hospitals; controls included teaching hospital, government hospital, and bed size and region dummies; management and clinical staff models were run separately.

Management R^2 was .65; adjusted R^2 was .64; clinical staff R^2 was .77; adjusted R^2 was .76.

^aManagement consists of hospital staff that selected their primary staff position as administration/management.

^bClinical staff consists of physicians, physician assistants, nurse practitioners, registered nurses, licensed practical nurses, and medical assistants.

* $p < .05$.

** $p < .01$.

*** $p < .001$.