ORIGINAL RESEARCH

Associations Between Perceived Crisis Mode Work Climate and Poor Information Exchange Within Hospitals

Mark E. Patterson, PhD, MPH[1]*, Miller S. Bogart[2], Kathleen R. Starr, PhD[3]

[1]Division of Pharmacy Practice and Administration, University of Missouri–Kansas City School of Pharmacy, Kansas City, Missouri; [2]University of Missouri–Kansas City School of Pharmacy, Kansas City, Missouri; [3]Behavioral Insights and Strategy, inVentiv Health, Inc., Newtown, Pennsylvania.

BACKGROUND: Because hospital units operating in crisis mode could create unsafe transitions of care due to miscommunication, our objective was to estimate associations between perceived crisis mode work climate and patient information exchange problems within hospitals.

METHODS: Self-reported data from 247,140 hospital staff members across 884 hospitals were obtained from the 2010 Hospital Survey on Patient Safety Culture. Presence of a crisis mode work climate was defined as respondents agreeing that the hospital unit in which they work tries to do too much too quickly. Presence of patient information exchange problems was defined as respondents agreeing that problems often occur in exchanging patient information across hospital units. Multivariable ordinal regressions estimated the likelihood of perceived problems in exchanging patient information across hospital units, controlling for per-

ceived levels of crisis mode work climate, skill levels, work climate, and hospital infrastructure.

RESULTS: Compared to those disagreeing, hospital staff members agreeing that the hospital unit in which they work tries to do too much too quickly were 1.6 times more likely to perceive problems in exchanging patient information across hospital units (odds ratio: 1.6, 95% confidence interval: 1.58–1.65).

CONCLUSIONS: Hospital staff members perceiving crisis mode work climates within their hospital unit are more likely to perceive problems in exchanging patient information across units, underscoring the need to improve communication during transitions of care. *Journal of Hospital Medicine* 2015;10:152–159. © 2014 Society of Hospital Medicine

Using electronic health records to improve the continuity of care between hospital units does not replace the need for interpersonal communication to improve transitions of care. Hospital personnel play a critical role in accurately exchanging patient information during patient transfers, a process requiring accurate communication between hospital units to prevent system failures.[1] Because poor communication contributes to preventable adverse events,[2] and effective communication during handoffs decreases medical errors and readmissions,[3] hospitals need to ensure their work environments are conducive to effective communication.

Individuals working under time constraints and heavy workloads could potentially be at high risk of misinterpreting or delivering inaccurate information,[4] partially due to limited ability to accurately process and communicate information under stressful circum-

stances. Furthermore, because time-constrained decision makers tend to use less information and less rigorous decision strategies,[5] work climates characterized by staff members "doing too many things too quickly" could cause patient health information to be lost during transitions of care across hospital units.

Current studies illustrate scenarios in which demanding or time-constrained work environments caused information exchange errors. One study found that the increased rate of prescribing errors was partially attributed to a high-demand work environment characterized by working after hours and multitasking.[6] Other studies found that clinicians' limited time to relay and respond to information and ask clarifying questions during patient handoffs was partially attributed to the fast-faced and chaotic environment of the emergency room.[7,8] These studies are consistent with another study that found patient handoffs between emergency departments and inpatient wards were inadequate, partially due to less interactive and more rushed communication.[9] The fact that communication breakdowns are widely cited as barriers to patient handoffs[7,8,10] and facilitators of medical errors,[7,8] further underscores the detrimental effect that crisis mode work climates could have on exchanging patient information during transitions of care.

The objective of this analysis was to evaluate the extent to which a crisis mode work climate impacts the occurrence of patient information exchange
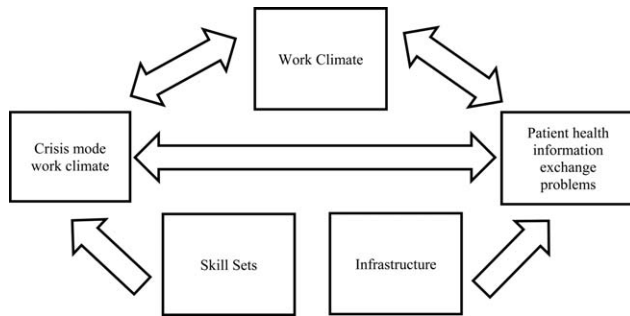
FIG. 1. Conceptual framework.

problems. Estimating associations between hospital staff members' perceptions of crisis mode work climates and perceptions of information exchange problems provide insights as to whether high-demand and time-constrained work climates negatively impact the exchange of patient information. Because hospital staff members working under time constraints and heavy workloads could potentially be at high risk of misinterpreting or delivering inaccurate information, we hypothesized that higher levels of a perceived crisis mode work climate would be associated with higher levels of perceived problems with information exchange across hospital units.

METHODS

Data Source

Data originated from the Agency of Healthcare Research and Quality 2010 Hospital Survey on Patient Safety Culture. This validated survey, designed to assess the safety climate within acute-care settings, remains an important annual survey deployed each year to track changes and factors impacting patient safety.[11] We included only those respondents who self-reported their position as a nurse, physician, pharmacist, dietician, therapist, technician, patient care assistant, or hospital unit secretary, all of whom are likely responsible for exchanging patient information across hospital units. For this reason, we excluded respondents who self-reported their position as administrative or miscellaneous. Applying these exclusion criteria resulted in 247,104 respondents across 884 hospitals.

Conceptual Framework

The relationship between perceived crisis mode work climates and patient information exchange problems is likely influenced by staff skill levels, work climate, and infrastructure (Figure 1). With respect to skill levels, hospital staff members with many years of experience compared to those with fewer years may be relatively desensitized to chaotic work environments and consequently have higher thresholds for perceiving crisis modes. Number of hours worked per week likely impacts perceived crisis mode as illustrated in 1 study finding that full-time nurses reported a signifi-

cantly lower work pace compared to part-time nurses.[12] Years of experience likely impacts perception of information exchange problems, particularly if staff members with many years of experience are familiar enough with hospital systems or protocols to easily detect exchange errors or mishaps.

With respect to work climates, workers' perception of cooperation, coordination and patient safety, and specific hospital unit likely impact perceptions of crisis work mode and information exchange problems. For example, hospital staff members reporting high levels of cooperation, coordination, and patient safety likely perceive fewer crisis modes and information exchange problems compared to those in less-cooperative hospital units. Furthermore, the heterogeneity of work cultures across departments within a hospital results in department-specific perceptions of crisis mode climates and information exchange problems. Infrastructure factors, such as hospital size, teaching and ownership status, and census region, likely impact the amount of resources available for staffing and infrastructure, which in turn could impact work pace and information exchange accuracy.

Variable Definitions

We defined our predictor as the perceived presence of a crisis mode work climate as captured from the survey questionnaire item: "We work in 'crisis mode' trying to do too much, too quickly." This question item had a Likert response scale comprised of the following 5 answer choices: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, (5) strongly agree. We created a 3-level response variable by aggregating the "agree" and "disagree" responses, respectively, as the first 2 levels, and retaining the "neutral" response as the third level. Consequently, those responding "strongly disagree" or "disagree" were classified as working in low–crisis mode work climates and those responding "strongly agree" or "agree" were classified as working in high–crisis mode work climates. We defined our outcome measure as the presence of patient information exchange problems as captured from the survey questionnaire item: "Problems often occur in the exchange of information across hospital units." Because this question item had a Likert response scale similar to the crisis mode question predictor, we also created a 3-level categorical variable in the same fashion. Consequently, those responding "strongly disagree" or "disagree" were classified as perceiving no problems exchanging patient information, and those responding "strongly agree" or "agree" were classified as perceiving problems exchanging patient information. For the fewer than 10% of the respondents with missing data on either the predictor our outcome variables, the mode measure of central tendency was imputed, a methodology validated in a previous study.[13]

We also included questionnaire items that captured staff skill levels, work climate, and infrastructure as

TABLE 1. Hospital and Survey Respondent Characteristics

Characteristics	%
Hospital characteristics, N = 884	
Bed size	
Small, 1–99	43.5
Medium, 100–399	43.8
Large, 400 plus	12.7
Teaching status	
Yes	32.2
No	67.8
Government ownership	
Yes	19.5
No	80.5
Census region	
Mid-Atlantic and New England	8.7
South Atlantic	14.8
Central	57.2
Mountain	7.7
Pacific	11.5
Response rate, mean (SD)	0.56 (0.28)
Respondents per hospital, mean (SD)	279 (358)
Respondent characteristics, N = 274,140	
How long have you worked in your current specialty or profession?	
<1 year	5.8
1–5 years	32.8
6–10 years	16.2
11–15 years	12.0
16–20 years	10.6
≥21 years	22.7
How long have you worked in this hospital?	
<1 year	9.8
1–5 years	42.8
6–10 years	17.8
11–15 years	9.0
16–20 years	8.2
≥21 years	12.4
How long have you worked in your current hospital work area/unit?	
<1 year	13.1
1–5 years	48.0
6–10 years	18.1
11–15 years	8.1
16–20 years	6.0
≥21 years	6.7
Typically, how many hours per week do you work in this hospital?	
<20 hours	4.8
20–39 hours	39.9
40–59 hours	48.8
60–79 hours	4.2
80–99 hours	2.1
≥100 hours	0.11
What is your staff position in this hospital?	
Registered nurse	51.2
Technician (eg, ECG, lab, radiology)	14.1
Unit assistant/clerk/secretary	8.5
Patient care assistant/hospital aide/care partner	7.4
Physical, occupational, or speech therapist	3.7
Attending/staff physician	3.5
LVN/LPN	3.0
Respiratory therapist	2.9
Pharmacist	2.2
Physician assistant/nurse practitioner	1.4
Resident physician/physician in training	1.2
Dietician	0.83
In your staff position, do you typically have direct interaction or contact with patients?	

TABLE 1. *Continued*

Characteristics	%
Yes	86.6
No	13.4
What is your primary work area or unit in this hospital?	
Other	27.7
Medicine (nonsurgical)	11.1
Surgery	10.0
Intensive care unit (any type)	8.6
Many different hospital units/no specific unit	6.8
Radiology	6.2
Emergency department	5.8
Obstetrics	4.9
Laboratory	4.9
Rehabilitation	4.2
Pediatrics	3.8
Pharmacy	3.2
Psychiatry/mental health	2.1
Anesthesiology	0.55

NOTE: **Abbreviations:** ECG, electrocardiography; LPN, licensed practical nurse; LVN, licensed vocational nurse; SD, standard deviation.

covariates to account for potential confounders (Figure 1). The staff skill levels domain included years of experience working in the hospital, specialty, and unit; current staff position; and extent of patient contact. The work climate domain included respondent perceptions of coordination and cooperation, patient safety, and primary work area or unit in which the provider reported working. The hospital infrastructure domain included bed size, census region, teaching status, and government ownership status. For the fewer than 10% of the respondents with missing data on any of the categorical variables, the mode measure of central tendency was imputed, a methodology validated in a previous study.[13]

Analytic Approach

We used multivariable ordinal regressions to estimate the likelihood of perceived problems in patient information exchange conditional upon perceptions of a crisis mode work climate, controlling for staff skill levels, work climate, and hospital infrastructure. Our estimates therefore reflect the likelihood of hospital staff responding "strongly agree or agree" to the question "Problems often occur in the exchange of information across hospital units" conditional upon responding "strongly agree or agree" to the question "We work in 'crisis mode' trying to do too much, too quickly." In addition to controlling for hospital-specific response rates, we also adjusted our standard errors to account for the clustering of respondents within hospitals. All analyses were conducted in SAS version 9.2 (SAS Institute Inc., Cary, NC).

RESULTS

The hospital sample averaged 279 respondents per hospital with a 56% response rate. Most hospitals

TABLE 2. Survey Respondent Work Environment Perceptions (N = 247,140)

Perceptions	%
We work in "crisis mode" trying to do too much, too quickly	
Strongly disagree	8.1
Disagree	39.2
Neutral	21.0
Agree	24.3
Strongly agree	7.5
Problems often occur in the exchange of information across hospital units	
Strongly disagree	4.6
Disagree	31.3
Neutral	37.3
Agree	24.0
Strongly agree	2.7
When a lot of work needs to be done quickly, we work together as a team to get the work done.	
Strongly disagree	1.5
Disagree	6.1
Neutral	7.5
Agree	53.6
Strongly agree	31.2
When one area in this unit gets really busy, others help out.	
Strongly disagree	3.9
Disagree	13.9
Neutral	13.7
Agree	52.6
Strongly agree	15.8
Hospital units do not coordinate well with each other.	
Strongly disagree	5.6
Disagree	38.8
Neutral	23.7
Agree	25.3
Strongly agree	6.6
There is good cooperation among hospital units that need to work together.	
Strongly disagree	2.7
Disagree	15.1
Neutral	24.7
Agree	51.1
Strongly agree	6.3
Please give your work area/unit in this hospital an overall grade on patient safety.	
Excellent	23.0
Very good	49.8
Acceptable	21.8
Poor	4.6
Failing	0.76
Staff in this unit work longer hours than is best for patient care.	
Strongly disagree	11.5
Disagree	42.2
Neutral	23.6
Agree	18.4
Strongly agree	6.3

were located in the Central region of the United States, and 32% and 19% were teaching and government-owned hospitals, respectively. Forty-three percent and 44% of the hospitals in the sample were designated as small and medium hospitals, respectively (Table 1).

Thirty-seven percent of the respondents have worked in their current specialty or profession for 5 years or less (Table 1). Over half of the respondents have worked in their current hospital for 5 years or less, whereas 61% have worked in their current unit within the hospital for 5 years or less. Forty-nine

percent work at least 40 hours per week. Registered nurses and technicians represented the 2 largest subgroups of staff positions, comprising 51% and 14% of the sample, respectively. Dieticians and resident physicians, on the other hand, represented the 2 smallest subgroups of staff positions, comprising 0.83% and 1.2% of the sample, respectively. Eighty-seven percent of the respondents have direct interaction or contact with patients. Apart from those responding "other" as their hospital unit, nonsurgical medicine and surgery represented the largest subgroup primary work areas, comprising 11% and 10% of the sample, respectively. In contrast, psychiatry and anesthesiology represented the 2 smallest subgroups of primary work areas, comprising 2.1% and 0.55% of the sample, respectively (Table 1).

Respondents scored relatively high with regard to teamwork and helping each other out under hurried or busy circumstances. For example, 85% agreed or strongly agreed that their unit worked together as a team to get work done when a lot of work needed to be completed quickly, and 68% agreed or strongly agreed that individuals within their unit helped out when an area in their unit became busy (Table 1). Despite this cooperation, 31% agreed or strongly agreed that hospital units did not coordinate well together. Paradoxically, 57% agreed or strongly agreed that there was good cooperation among hospital units that needed to work together. Seventy-five percent of the respondents reported excellent or very good patient safety levels within their unit, although 53% agreed or strongly agreed that staff worked longer hours than was best for patient care (Table 1).

With regard to perceived crisis mode work climate, 32% and 47% reported agreeing and disagreeing, respectively, that their work unit worked in crisis mode trying to do too much too quickly (Table 2). With regard to perceived problems with patient information exchange, 27% and 36% reported agreeing

TABLE 3. Bivariate Frequency Distribution of Respondents' Perceptions of Crisis Mode Work Climate and Patient Information Exchange Problems Between Hospital Units

	Problems Often Occur in Exchange of Information Across Hospital Units		
	Agree (N = 66,115), Row %*	Neutral (N = 92,228), Row %†	Disagree (N = 88,797), Row %‡
Crisis Mode Work Climate			
Agree (N = 78,253)§	40.8	35.4	23.8
Neutral (N = 51,836)|	22.9	48.9	28.2
Disagree (N = 116,781)¶	19.0	33.5	47.5

NOTE: *Agree or strongly agree that problems often occur in exchange of information across hospital units. †Neutral response that problems often occur in exchange of information across hospital units. ‡Disagree or strongly disagree that problems often occur in exchange of information across hospital units. §Agree or strongly agree that we work in crisis mode trying to do too much too quickly. |Neutral response that we work in crisis mode trying to do too much too quickly. ¶Disagree or strongly disagree that we work in crisis mode trying to do too much too quickly.

TABLE 4. Multivariate Ordinal Regression Results Illustrating Likelihood of Perceiving Information Exchange Problems Across Hospital Units Conditional Upon Crisis Mode Work Climate

Characteristic	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Primary predictor of interest		
Crisis mode work climate		
Agree[†]	3.0 (2.9-3.1)	1.6 (1.5-1.6)
Neutral[‡]	1.8 (1.7-1.8)	1.3 (1.2-1.3)
Disagree[§]	Reference	Reference
Hospital characteristics		
Bed Size		
Small, 6–24	0.51 (0.44-0.59)	0.66 (0.59-0.75)
Small, 2–49	0.59 (0.53-0.66)	0.77 (0.70-0.84)
Small, 50–99	0.65 (0.58-0.73)	0.78 (0.71-0.84)
Medium, 100–199	0.85 (0.77-0.95)	0.92 (0.86-1.0)
Medium, 200–299	1.0 (0.98-1.1)	0.97 (0.90-1.0)
Medium, 300–399	0.96 (0.85-1.1)	1.0 (0.92-1.1)
Large, 400–499	0.99 (0.86-1.1)	0.96 (0.87-1.0)
Large, 500 plus	Reference	Reference
Teaching status		
No	0.81 (0.76-0.87)	1.0 (0.95-1.0)
Yes	Reference	Reference
Government ownership		
No	1.1 (1.0–1.2)	1.0 (0.98-1.1)
Yes	Reference	Reference
Census region		
Mid-Atlantic and New England	1.0 (0.88-1.1)	0.91 (0.84-0.99)
South Atlantic	0.95 (0.85-1.1)	1.0 (0.95-1.1)
Central 1	0.95 (0.85-1.0)	0.95 (0.89-1.0)
Central 2	0.71 (0.62-0.81)	0.91 (0.83-0.99)
Central 3	0.80 (0.71-0.91)	0.97 (0.90-1.0)
Central 4	0.76 (0.68-0.86)	0.93 (0.85-1.0)
Mountain	0.84 (0.73-0.96)	0.98 (0.90-1.1)
Pacific	Reference	Reference
Average survey response rate within hospital	0.65 (0.58-0.72)	0.93 (0.82-1.0)
Respondent characteristics		
How long have you worked in your current specialty or profession?		
<1 year	0.75 (0.73-0.78)	1.03 (0.99-1.1)
1–5 years	0.99 (0.97-1.0)	1.1 (1.1-1.1)
6–10 years	1.0 (1.0-1.1)	0.99 (0.96-1.0)
11–15 years	1.0 (1.0-1.1)	1.0 (0.97-1.0)
16–20 years	1.0 (0.98-1.0)	0.97 (0.94-1.0)
≥21 years	Reference	Reference
How long have you worked in this hospital?		
<1 year	0.75 (0.73-0.77)	0.90 (0.85-0.90)
1–5 years	1.03 (1.00–1.05)	0.99 (0.95-1.0)
6–10 years	1.1 (1.1-1.1)	0.99 (0.95-1.0)
11–15 years	1.1 (1.0–1.1)	1.0 (0.96-1.0)
16–20 years	1.1 (1.0–1.1)	0.98 (0.94-1.0)
≥21 years	Reference	Reference
How long have you worked in your current hospital work area/unit?		
<1 year	0.79 (0.76-0.82)	0.98 (0.93-1.0)
1–5 years	1.0 (1.0–1.1)	1.0 (0.99-1.1)
6–10 years	1.1 (1.1-1.1)	1.0 (1.0–1.1)
11–15 years	1.1 (1.0–1.1)	1.0 (0.99-1.0)
16–20 years	1.1 (1.0–1.1)	1.1 (1.0–1.1)
≥21 years	Reference	Reference
Typically, how many hours per week do you work in this hospital?		
<20	0.63 (0.50-0.79)	0.91 (0.72-1.2)
20–39	0.75 (0.59-0.94)	0.90 (0.71-1.1)
40–59	0.87 (0.69-1.1)	1.1 (0.85-1.4)
60–79	0.95 (0.75-1.2)	1.0 (0.82-1.3)
80–99	0.99 (0.78-1.2)	1.1 (0.86-1.4)
≥100	Reference	Reference

TABLE 4. *Continued*

Characteristic	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
What is your staff position in this hospital?		
Registered nurse	0.92 (0.90-0.94)	1.1 (0.98-1.0)
Technician (eg, ECG, lab, radiology)	Reference	Reference
Unit assistant/clerk/secretary	0.79 (0.76-0.81)	0.94 (0.80-0.96)
Patient care assistant/hospital aide/care partner	0.78 (0.75-0.81)	0.96 (0.90-0.98)
Physical, occupational, or speech therapist	0.88 (0.84-0.92)	1.2 (1.1-1.2)
Attending/staff physician	1.0 (0.97-1.1)	1.3 (1.2-1.3)
LVN/LPN	0.89 (0.85-0.94)	1.0 (0.92-1.0)
Respiratory therapist	0.84 (0.80-0.88)	0.97 (0.89-1.0)
Pharmacist	1.5 (1.4-1.6)	1.3 (1.1-1.3)
Physician assistant/nurse practitioner	0.93 (0.87-1.0)	1.2 (1.1-1.2)
Resident physician/physician in training	0.96 (0.89-1.0)	1.3 (1.2-1.4)
Dietician	0.86 (0.79-0.94)	1.2 (1.1-1.3)
In your staff position, do you typically have direct interaction or contact with patients?		
Yes	0.83 (0.82-0.85)	0.85 (0.83-0.87)
No	Reference	Reference
What is your primary work area or unit in this hospital?		
Other	Reference	Reference
Medicine (nonsurgical)	1.1 (1.0–1.1)	0.84 (0.82-0.89)
Surgery	1.1 (1.1-1.2)	0.88 (0.86-0.91)
Intensive care unit (any type)	0.93 (0.90-0.96)	0.78 (0.76-0.81)
Many different hospital units/no specific unit	1.2 (1.1-1.2)	1.0 (0.98- 1.0)
Radiology	1.1 (1.1-1.1)	1.0 (1.0–1.1)
Emergency department	1.0 (0.97-1.0)	0.57 (0.55-0.60)
Obstetrics	0.76 (0.73-0.79)	0.66 (0.63-0.69)
Laboratory	1.2 (1.2-1.3)	1.0 (1.0–1.1)
Rehabilitation	1.0 (0.97-1.0)	1.0 (0.98-1.1)
Pediatrics	0.90 (0.86-0.94)	0.83 (0.80-0.87)
Pharmacy	1.6 (1.5-1.7)	1.1 (1.0–1.2)
Psychiatry/mental health	1.2 (1.1-1.2)	0.96 (0.90-1.0)
Anesthesiology	1.1 (1.0–1.3)	0.93 (0.83-1.0)
Respondent perceptions		
When a lot of work needs to be done quickly, we work together as a team to get the work done.		
Strongly disagree	3.2 (3.0–3.4)	1.0 (0.98-1.1)
Disagree	3.2 (3.1–3.3)	1.0 (1.0–1.1)
Neutral	2.3 (2.2-2.4)	0.98 (0.94-1.0)
Agree	2.3 (2.2-2.4)	1.0 (1.002-1.04)
Strongly agree	Reference	Reference
Staff in this unit work longer hours than is best for patient care.		
Strongly disagree	0.51 (0.48-0.53)	0.76 (0.73-0.79)
Disagree	0.68 (0.67-0.70)	0.81 (0.78-0.84)
Neutral	0.94 (0.91-0.97)	0.93 (0.90-0.97)
Agree	1.0 (0.99-1.1)	0.94 (0.91-0.98)
Strongly agree	Reference	Reference
When 1 area in this unit gets really busy, others help out.		
Strongly disagree	3.8 (3.7 - 4.0)	1.0 (0.96-1.1)
Disagree	3.0 (2.9-3.1)	1.0 (0.99-1.1)
Neutral	2.2 (2.1–2.3)	1.0 (0.97-1.0)
Agree	1.5 (1.5-1.6)	0.99 (0.96-1.0)
Strongly agree	Reference	Reference
Hospital units do not coordinate well with each other.		
Strongly disagree	0.03 (0.03-0.04)	0.10 (0.10-0.11)
Disagree	0.08 (0.08-0.08)	0.18 (0.17-0.19)
Neutral	0.21 (0.20-0.22)	0.32 (0.30-0.33)
Agree	0.50 (0.48-0.52)	0.61 (0.58-0.63)
Strongly agree	Reference	Reference
There is good cooperation among hospital units that need to work together.		
Strongly disagree	20.1 (18.9–21.5)	4.7 (4.3–5.0)
Disagree	14.2 (13.6–14.9)	4.2 (4.1–4.5)
Neutral	6.7 (6.4–7.0)	2.7 (2.6-2.8)
Agree	2.4 (2.3-2.5)	1.6 (1.6-1.7)
Strongly agree	Reference	Reference

TABLE 4. *Continued*

Characteristic	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Please give your work area/unit in this hospital an overall grade on patient safety		
Excellent	0.13 (0.12-0.14)	0.47 (0.42-0.52)
Very good	0.24 (0.21-0.26)	0.63 (0.57-0.70)
Acceptable	0.49 (0.45-0.54)	0.79 (0.72-0.88)
Poor	0.83 (0.75-0.92)	0.92 (0.83-1.03)
Failing	Reference	Reference

NOTE: **Abbreviations:** CI, confidence interval; ECG, electrocardiography; LPN, licensed practical nurse; LVN, licensed vocational nurse; OR, odds ratio. *Controlling for hospital characteristics, respondent characteristics, and respondent perceptions as measured by covariates listed within the table. [†]Agree or strongly agree that we work in crisis mode trying to do too much too quickly. [‡]Neutral response that we work in crisis mode trying to do too much too quickly. [§]Disagree or strongly disagree that we work in crisis mode trying to do too much too quickly.

and disagreeing, respectively, that information exchange problems occurred across hospital units (Table 2).

In the unadjusted analyses, crisis mode perceptions and information exchange problem perceptions were significantly associated. Among those who agreed that their work unit worked in crisis mode, a larger proportion of respondents agreed (41%) versus disagreed (24%) that problems often occurred in exchanging patient information across units (Table 3). In contrast, among those who disagreed that their work unit worked in crisis mode, a larger proportion of respondents disagreed (47%) versus agreed (19%) that problems often occurred in exchanging patient information across units (Table 3).

In the multivariable ordinal regression, compared to those who disagreed that their unit worked in crisis mode, those who agreed were 1.6 times more likely to report that problems often occurred in exchanging patient information across units (odds ratio [OR]: 1.6, 95% confidence interval [CI]: 1.58-1.65) (Table 4). Additionally, some key covariates were independently associated with perceptions of information exchange problems. Two of these covariates measured workplace coordination. Those who reported that hospital units did not cooperate well together were more likely to report problematic information exchange compared to those who reported that hospital units did cooperate well (OR: 4.7, 95% CI: 4.3–5.0). Relatedly, those who reported that hospital units did coordinate well were less likely to report problematic information exchange compared to those who reported that hospital units did not coordinate well (OR: 0.10, 95% CI: 0.10-0.11). Two other covariates measured patient contact and perceptions about long working hours. Those who reported having direct interaction or contact with patients were less likely to report problematic information exchange compared to those who reported not having direct interaction or contact with patients (OR: 0.85, 95% CI: 0.83-0.87). Those who reported that staff did not work longer hours than

was better for patient care were less likely to report problematic information exchange compared to those who did report working longer hours than was better for patient care (OR: 0.76, 95% CI: 0.73 – 0.79). One covariate measured hospital size. Those who reported working in smaller hospitals were less likely to report problematic information exchange compared to those reporting working in large hospitals (OR: 0.66, 95% CI 0.59-0.75) (Table 4).

DISCUSSION

Our results illustrate that when hospital staff agree that their hospital works in crisis mode, they are more likely to agree that their hospital unit had frequent problems exchanging patient information across units. Because hospital staff working under time constraints and heavy workloads could potentially be at risk of misinterpreting or delivering inaccurate information, these results imply that crisis mode work climates increase the risk of problematic health information exchange. An equally plausible interpretation could be that problematic patient health information exchange increases the risk of hospital staff perceiving crisis mode work climates. Given that information gaps are associated with patient handoff errors,[14] and that patient handoff errors are associated with adverse events,[2,3,6,8] an urgent need exists to implement information exchange systems that prevent information gaps from harming patients. Consequently, hospitals need to implement workflow strategies that prevent information gaps from undermining patient safety during transitions of care.

Other factors affect information exchange apart from crisis mode work climate, as illustrated by the significant associations of key covariates in the multivariate model. The effect found between perceived coordination and information exchange implies that improving information exchange requires good cooperation and coordination. The effect found between patient contact and information exchange implies that working directly with patients improves either the accuracy or the perception of information exchange. Finally, the effect found between hospital size and information exchange suggests that small hospitals are less likely than large hospitals to have information exchange problem. The geographical dispersion and the complexity of larger institutions could result in information exchange problems due to more confusion and less in-person communication.

Because problematic patient information exchanges are associated with hospital size, coordination, and patient contact, in addition to crisis mode work climate, multifaceted solutions are necessary to resolve the problem. For example, hospital interventions designed to improve coordination could in turn attenuate perceived crisis modes. Furthermore, tailoring these interventions to hospitals that belong to complex geographically dispersed provider networks

would likely decrease errors during transitions of care. Because multiple factors cause information exchange problems, implementing interventions that improve both coordination and crisis mode work climates would likely result in a greater net improvement compared to interventions focused solely on decreasing crisis mode work climates.

Some limitations of our paper are worth noting. First, we did not have information on the volume of data exchanged or the functionality levels of the electronic health record systems, both of which likely impact the accuracy of patient information exchange. For example, hospitals with smaller versus larger amounts of data exchanged could be less prone to error. On the other hand, this risk of error could be reduced even further by implementing robust health information technology (IT) systems that improve the accuracy of information transfer. This is consistent with studies showing that hospitals without computerized provider order entry (CPOE) systems have been shown to have higher medication error rates compared to those hospitals with CPOE systems.[15] Therefore, omitting data volume and health IT capabilities from the multivariate model could introduce unobserved heterogeneity, resulting in biased associations between perceived crisis mode work climate and perceived information exchange problems. Second, the cross-sectional design limits our ability to infer causality because we are not certain whether the perceived crisis mode occurred before, after, or simultaneously to perceived information exchange problems. Third, the self-reported nature of the questionnaire items does not provide information on observed levels of crisis mode and exchange problems, which could be inconsistent with perceived levels. Fourth, the relatively low within-hospital response rate decreases the external validity of our findings. For example, if responders' perceptions of crisis mode or information exchange problems significantly differed from nonresponders, our results would not be generalizable to the larger population of acute-care hospitals across the United States. Therefore, conclusions should be viewed with caution if applying these results to hospitals with respondents significantly differing from those contained within our sample.

Despite these limitations, the large sample size in conjunction with the use of data from a survey having acceptable psychometric properties[16] strengthens the external and internal validity of our findings. Although questionnaire items measuring perceptions are relatively subjective in nature compared to using metrics that capture observed problems or crisis modes, we argue that staff perception data are equally informative, as they guide organization leaders on how to improve workplace performance. Because a core concept of high reliability organizations (HROs) is to "preserve constant awareness by key leaders and staff of the state of the systems and processes that affect patient care,"[17] HROs could benefit from knowing the extent to which staff perceptions impact patient care. From a methods perspective, the multivariable ordinal regressions enabled us to control for potential confounders that if omitted could have resulted in biased estimates. Furthermore, low levels of multicollinearity as illustrated by low variation inflation factors enabled us to isolate the independent effect of crisis mode perceptions. Including hospital size and hospital work unit as covariates was an additional methodological strength helping account for the unobserved heterogeneity caused by excluding volume of data exchanged or health IT system capability. For example, because larger compared to smaller hospitals usually have more sophisticated health IT systems,[15] including bed size in the model theoretically captures some of the variation that would have been captured if we were able to include a covariate measuring health IT capability. Last, using ordinal regression facilitates interpretation of the findings because the questionnaire items for the predictor and outcome were originally captured on a Likert scale.

Our findings underscore the significant impact that work climate has on accurate information exchange, and ultimately patient safety. Improving patient safety is imperative for hospitals, especially within the context of recent regulations stemming from the Affordable Care Act that incentivize hospitals to reduce readmissions[18] and improve transitions of care.[19] Because accurate health information exchange is a critical component of patient care, resolving barriers that decrease the accuracy of this exchange is essential. Therefore, future studies need to continue examining these associations within the context of study designs that incorporate longitudinal data and datasets that include objective measures capturing crisis mode work climates and information exchange problems. Because effective communication during handoffs is associated with decreases in medical errors and readmissions, hospitals need to continually ensure that work environments are conducive to effective patient information exchange.

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