

ORIGINAL RESEARCH

Relationships Within Inpatient Physician Housestaff Teams and Their Association With Hospitalized Patient Outcomes

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IMPORTANCE: Improving inpatient care delivery has historically focused on improving individual components of the system. Applying the complexity science framework to clinical systems highlights the important role of relationships among providers in influencing system function and clinical outcomes.

OBJECTIVE: To understand whether inpatient medical physician teams can be differentiated based on the relationships among team members, and whether these relationships are associated with patient outcomes, including length of stay (LOS), unnecessary length of stay (ULOS), and complication rates.

DESIGN: Eleven inpatient medicine teams were observed daily during attending rounds for 2- to 4-week periods from September 2008 through June 2011. Detailed field notes were taken regarding patient care activities, team behaviors, and patient characteristics and outcomes. Behaviors were categorized using the Lanham relationship framework, giving each team a relationship score. We used factor analysis to assess the pattern of relationship characteristics and assessed the association between relationship characteristics and patient outcomes.

SETTING: Observations occurred at the Audie L. Murphy Veterans Affairs Hospital and University Hospital in San Antonio, Texas.

PARTICIPANTS: Physicians were chosen based on rotation schedules, experience, and time of year. Patients were included based on their admission to the inpatient medicine teams that were being observed.

MAIN MEASURES: Relationship scores were based on the presence or absence of 7 relationship characteristics. LOS, ULOS, and complication rates were assessed based on team discussions and chart review. The association between relationships and outcomes was assessed using the Kruskal-Wallis rank sum test.

RESULTS: We observed 11 teams over 352.9 hours, observing 1941 discussions of 576 individual patients. Teams exhibited a range of 0 to 7 relationship characteristics. Relationship scores were significantly associated with complication rates, and presence of trust and mindfulness among teams was significantly associated with ULOS and complication rates.

CONCLUSIONS: Our findings are an important step in understanding the impact of relationships on the outcomes of hospitalized medical patients. This understanding could expand the scope of interventions to improve hospital care to include not only process improvement but also relationships among providers. *Journal of Hospital Medicine* 2014;9:764–771. © 2014 Society of Hospital Medicine

Since the Institute of Medicine Report “To Err is Human,” increased attention has been paid to improving the care of hospitalized patients.¹ Strategies include utilization of guidelines and pathways, and the application of quality improvement techniques to improve or standardize processes. Despite improvements in focused areas such as prevention of hospital-acquired

infections, evidence suggests that outcomes for hospitalized patients remain suboptimal.² Rates of errors and hospital-related complications such as falls, decubitus ulcers, and infections remain high,^{3–5} and not all patients receive what is known to be appropriate care.⁶

Many attempts to improve inpatient care have used process-improvement approaches, focusing on impacting individuals’ behaviors, or on breaking down processes into component parts. Examples include central line bundles or checklists.^{7,8} These approaches attempt to ensure that providers do things in a standardized way, but are implicitly based on the reductionist assumption that we can break processes down into predictable parts to improve the system. An alternative way to understand clinical systems is based on interdependencies between individuals in the system,

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or the ways in which parts of the system interact with each other, which may be unpredictable over time.^{1,9} Whereas these interdependencies include care processes, they also encompass the providers who care for patients. Providers working together vary in terms of the kinds of relationships they have with each other. Those relationships are crucial to system function because they are the foundation for the interactions that lead to effective patient care.

The application of several frameworks or approaches for considering healthcare systems in terms of relationships highlights the importance of this way of understanding system function. The include complexity science,^{1,7} relational coordination (which is grounded in complexity science),¹⁰ high reliability,¹¹ and the Big Five for teamwork.¹²

Research indicates that interactions among healthcare providers can have important influences on outcomes.^{13–17} Additionally, the initial implementation of checklists to prevent central-line associated infections appeared to change provider relationships in a way that significantly influenced their success.¹⁸ For example, positive primary care clinic member relationships as assessed by the Lanham framework have been associated with better chronic care model implementation, learning, and patient experience of care.^{19,20} This framework, which we apply here, identifies 7 relationship characteristics: (1) trust; (2) diversity; (3) respect; (4) mindfulness, or being open to new ideas from others; (5) heedfulness, or an understanding of how one's roles influence those of others; (6) use of rich in-person or verbal communication, particularly for potentially ambiguous information open to multiple interpretations; and (7) having a mixture of social and task relatedness among teams, or relatedness outside of only work-related tasks.¹⁹ Relationships within surgical teams that are characterized by psychological safety and diversity are associated with successful uptake of new techniques and decreased mortality.^{13,14} Relationships are important because the ability of patients and providers to learn and make sense of their patients' illnesses is grounded in relationships.

We sought to better understand and characterize inpatient physician teams' relationships, and assess the association between team relationships as evaluated by Lanham's framework and outcomes for hospitalized patients. Data on relationships among inpatient medical teams are few, despite the fact that these teams provide a great proportion of inpatient care. Additionally, the care of hospitalized medical patients is complex and uncertain, often involving multiple providers, making provider relationships potentially even more important to outcomes than in other settings.

METHODS

Overview

We conducted an observational, convergent mixed-methods study of inpatient medicine teams.^{21–23} We

focused on inpatient physician teams, defining them as the functional work group responsible for medical decision making in academic medical centers. Physician teams in this context have been studied in terms of social hierarchy, authority, and delegation.^{24–26} Focusing on the relationships within these groups could provide insights into strategies to mitigate potential negative effects of hierarchy. We recognize that other providers are closely involved in the care of hospitalized patients, and although we did not have standard interactions between physicians, nurses, case managers, and other providers that we could consistently observe, we did include interactions with these other providers in our observations and assessments of team relationships. Because this work is among the first in inpatient medical teams, we chose to study a small number of teams in great depth, allowing us to make rich assessments of team relationships.

We chose patient outcomes of length of stay (LOS), unnecessary LOS (ULOS), and complication rates, adjusted for patient characteristics and team workload. LOS is an important metric of inpatient care delivery. We feel ULOS is an aspect of LOS that is dependent on the physician team, as it reflects their preparation of the patient for discharge. Finally, we chose complication rates because hospital-acquired conditions and complications are important contributors to inpatient morbidity, and because recent surgical literature has identified complication rates as a contributor to mortality that could be related to providers' collective ability to recognize complications and act quickly.

This study was approved by the institutional review board at the University of Texas Health Science Center at San Antonio (UTHSCSA), the Research and Development Committee for the South Texas Veterans Health Care System (STVHCS), and the Research Committee at University Health System (UHS). All physicians consented to participate in the study. We obtained a waiver of consent for inclusion of patient data.

Setting and Study Participants

This study was conducted at the 2 UTHSCSA primary teaching affiliates. The Audie L. Murphy Veterans Affairs Hospital is the 220-bed acute-care hospital of the STVHCS. University Hospital is the 614-bed, level-I trauma, acute-care facility for UHS, the county system for Bexar County, which includes the San Antonio, Texas major metropolitan area.

The inpatient internal medicine physician team was our unit of study. Inpatient medicine teams consisted of 1 faculty attending physician, 1 postgraduate year (PGY)-2 or PGY-3 resident, and 2 PGY-1 members. In addition, typically 2 to 3 third-year medical students were part of the team, and a subintern was sometimes present. Doctor of Pharmacy faculty and students were also occasionally part of the team.

Social workers and case managers often joined team rounds for portions of the time, and nurses sometimes joined bedside rounds on specific patients. These teams admit all medicine patients with the exception of those with acute coronary syndromes, new onset congestive heart failure, or arrhythmias. Patients are randomly assigned to teams based on time of admission and call schedules.

Between these 2 hospitals, there are 10 inpatient medicine teams caring for patients, with a pool of over 40 potential faculty attendings. Our goal was to observe teams that would be most likely to vary in terms of their relationship characteristics and patient outcomes through observing teams with a range of individual members. We used a purposeful sampling approach to obtain a diverse sample, sampling based on physician attributes and time of year.^{16,17} Three characteristics were most important: attending physician years of experience, attending involvement in educational and administrative leadership, and the presence of struggling resident members, as defined by being on probation or having been discussed in the residency Clinical Competency Committee. We did not set explicit thresholds in terms of attending experience, but instead sought to ensure a range. The attendings we observed were more likely to be involved in education and administrative leadership activities, but were otherwise similar to those we did not observe in terms of years of experience. We included struggling residents to observe individuals with a range of skill sets, and not just high-performing individuals. We obtained attending information based on our knowledge of the attending faculty pool, and from the internal medicine residency program. We sampled across the year to ensure a diversity of trainee experience, but did not observe teams in either July or August, as these months were early in the academic year. Interns spend approximately 5 months per year on inpatient services, whereas residents spend 2 to 3 months per year. Thus, interns but not residents observed later in the year might have spent significantly more time on an inpatient service. However, in all instances, none of the team members observed had worked together previously.

Data Collection

Data were collected over nine 1-month periods from September 2008 through June 2011. Teams were observed daily for 2- to 4-week periods during morning rounds, the time when the team discusses each patient and makes clinical decisions. Data collection started on the first day of the month, the first day that all team members worked together, and continued for approximately 27 days, the last day before the resident rotated to a different service. By comprehensively and systematically observing these teams' daily rounds, we obtained rich, in-depth data with multiple

data points, enabling us to assess specific team behaviors and interactions.

During the third and fourth months, we collected data on teams in which the attending changed partway through. We did this to understand the impact of individual attending change on team relationships. Because the team relationships differed with each attending, we analyzed them separately. Thus, we observed 7 teams for approximately 4-week periods and 4 teams for approximately 2-week periods.

Observers arrived in the team room prior to rounds to begin observations, staying until after rounds were completed. Detailed free-text field notes were taken regarding team activities and behaviors, including how the teams made patient care decisions. Field notes included: length of rounds, which team members spoke during each patient discussion, who contributed to management discussions, how information from consultants was incorporated, how communication with others outside of the team occurred, how team members spoke with each other including the types of words used, and team member willingness to perform tasks outside of their usually defined role, among others. Field notes were collected in an open-ended format to allow for inductive observations. Observers also recorded clinical data daily regarding each patient, including admission and discharge dates, and presenting complaint.

The observation team consisted of the principle investigator (PI) (hospitalist) and 2 research assistants (a graduate-level medical anthropologist and social psychologist), all of whom were trained by a qualitative research expert to systematically collect data related to topics of interest. Observers were instructed to record what the teams were doing and talking about at all times, noting any behaviors that they felt reflected how team members related to each other and came to decisions about their patients, or that were characteristic of the team. To ensure consistency, the PI and 1 research assistant conducted observations jointly at the start of data collection for each team, checking concordance of observations daily using a percent agreement until general agreement on field note content and patient information reached 90%. Two individuals observed 24 days of data collection, representing 252 patient discussions (13% of observed discussions).

An age-adjusted Charlson-Deyo comorbidity score was calculated for each patient admitted to each team, using data from rounds and from each hospital's electronic health records (EHR).²⁷ We collected data regarding mental health conditions for each patient (substance use, mood disorder, cognitive disorder, or a combination) because these comorbidities could impact LOS or ULOS. Discharge diagnoses were based on the discharge summary in the EHR. We also collected data daily regarding team census and numbers of admissions to and discharges from each team to assess workload.

Three patient outcomes were measured: LOS, ULOS, and complications. LOS was defined as the total number of days the patient was in the hospital. ULOS was defined as the number of days a patient remained in the hospital after the day the team determined the patient was medically ready for discharge (assessed by either discussion on rounds or EHR documentation). ULOS may occur when postdischarge needs have been adequately assessed, or because of delays in care, which may be related to provider communication during the hospitalization. Complications were defined on a per-patient, per-day basis in 2 ways: the development of a new problem in the hospital, for example acute kidney injury, a hospital-acquired infection, or delirium, or by the team noting a clinical deterioration after at least 24 hours of clinical stability, such as the patient requiring transfer to a higher level of care. Complications were determined based on discussions during rounds, with EHR verification if needed.

Analysis Phase I: Assessment of Relationship Characteristics

After the completion of data collection, field notes were reviewed by a research team member not involved in the original study design or primary data collection (senior medical student). We took this approach to guard against biasing the reviewer's view of team behaviors, both in terms of not having conducted observations of the teams and being blinded to patient outcomes.

The reviewer completed a series of 3 readings of all field notes. The first reading provided a summary of the content of the data and the individual teams. Behavioral patterns of each team were used to create an initial team profile. The field notes and profiles were reviewed by the PI and a coauthor not involved in data collection to ensure that the profiles adequately reflected the field notes. No significant changes to the profiles were made based on this review. The profiles were discussed at a meeting with members of the larger research team, including the PI, research assistants, and coinvestigators (with backgrounds in medicine, anthropology, and information and organization management). Behavior characteristics that could be used to distinguish teams were identified in the profiles using a grounded theory approach.

The second review of field notes was conducted to test the applicability of the characteristics identified in the first review. To systematically record the appearance of the behaviors, we created a matrix with a row for each behavior and columns for each team to note whether they exhibited each behavior. If the behavior was exhibited, specific examples were cataloged in the matrix. This matrix was reviewed and refined by the research team. During the final field note review meeting, the research team compared the summary matrix

for each team, with the specific behaviors noted during the first reading of the field notes to ensure that all behaviors were recorded.

After cataloging behaviors, the research team assigned each behavior to 1 of the 7 Lanham relationship characteristics. We wanted to assess our observations against a relationship framework to ensure that we were able to systematically assess all aspects of relationships. The Lanham framework was initially developed based on a systematic review of the organizational and educational literatures, making it relevant to the complex environment of an academic medical inpatient team and allowing us to assess relationships at a fine-grained, richly detailed level. This assignment was done by the author team as a group. Any questions were discussed and different interpretations resolved through consensus. The Lanham framework has 7 characteristics.¹⁹ Based on the presence of behaviors associated with each relationship characteristic, we assigned a point to each team for each relationship characteristic observed. We considered a behavior type to be present if we observed it on at least 3 occasions on separate days. Though we used a threshold of at least 3 occurrences, most teams that did not receive a point for a particular characteristic did not have any instances in which we observed the characteristic. This was particularly true for trust and mindfulness, and least so for social/task relatedness. By summing these points, we calculated a total relationship score for each team, with potential scores ranging from 0 (for teams exhibiting no behaviors reflecting a particular relationship characteristic) to 7.

Analysis Phase II: Factor Analysis

To formally determine which relationship characteristics were most highly related, data were submitted to a principal components factor analysis using oblique rotation. Item separation was determined by visual inspection of the scree plot and eigenvalues over 1.

Analysis Phase III: Assessing the Association between Physician Team Relationship Characteristics and Patient Outcomes

We examined the association between team relationships and patient outcomes using team relationship scores. For the LOS/ULOS analysis, we only included patients whose entire hospitalization occurred under the care of the team we observed. Patients who were on the team at the start of the month, were transferred from another service, or who remained hospitalized after the end of the team's time together were excluded. The longest possible LOS for patients whose entire hospitalization occurred on teams that were observed for half a month was 12 days. To facilitate accurate comparison between teams, we only included patients whose LOS was ≤ 12 days.

Complication rates were defined on a per-patient per-day basis to normalize for different team volumes

TABLE 1. Relationship Characteristics and Observed Behaviors

Relationship Characteristic	Definition	Thirteen Types of Behaviors Observed in Field Notes	Observed Examples
Trust	Willingness to be vulnerable to others	Use of “we” instead of “you” or “I” by the attending Attending admitting “I don’t know” Asking questions to help team members to think through problems	“Where are we going with this guy?” “Let’s go talk to him, I can’t figure this out” “Will the echo change our management? How will it help us?”
Diversity	Including different perspectives and different thinking	Team member participation in conversations about patients that are not theirs Inclusion of perspectives of those outside the team (nursing and family members)	One intern is presenting, another intern asks a question, and the resident joins the discussion Taking a break to call the nurse, having a family meeting
Respect	Valuing the opinions of others, honest and tactful interactions	Use of positive reinforcement by the attending How the team talks with patients	Being encouraging of the medical student’s differential, saying “excellent” Asking if the patient has any concerns, what they can do to make them comfortable
Heedfulness	Awareness of how each person’s roles impact the rest of the team	Team members performing tasks not expected of their role Summarizing plans and strategizing	One intern helping another with changing orders to transfer a patient Attending recaps the plan for the day, asks what they can do
Mindfulness	Openness to new ideas/free discussion about what is and is not working	Entire team engaged in discussion	Attending asks the medical student, intern, and resident what they think is going on
Social relatedness	Having socially related interactions	Social conversation among team members Jokes by the attending	Intern talks about their day off “Showers and a bowel movement is the key to making people happy”
Appropriate use of rich communication	Use of in-person communication for sensitive or difficult issues	Using verbal communication with consultants or family	Intern is on the phone with the pharm D because there is a problem with the medication

and days of observation. For this analysis, we included patients who remained on the team after data collection completion, patients transferred to another team, or patients transferred from another team. However, we only counted complications that occurred at least 24 hours following transfer to minimize the likelihood that the complication was related to the care of other physicians.

Preliminary analysis involved inspection and assessment of the distribution of all variables followed, by a general linear modeling approach to assess the association between patient and workload covariates and outcomes.^{28,29} Because we anticipated that outcome variables would be markedly skewed, we also planned to assess the association between relationship characteristics with outcomes using the Kruskal-Wallis rank sum test to compare groups with Dunn’s test³⁰ for pairwise comparisons if overall significance occurred.³¹ There are no known acceptable methods for covariate adjustments using the Kruskal-Wallis method. All models were run using SAS software (SAS Institute Inc., Cary, NC).³²

RESULTS

The research team observed 1941 discussions of 576 individual patients. Observations were conducted over 352 hours and 54 minutes, resulting in 741 pages of notes (see Supporting Table 1 in the online version of this article for data regarding individual team members). Teams observed over half-months are referred to with “a” and “b” designations.

Creation of team profiles yielded 13 common behavior characteristics that were inductively

identified and that could potentially distinguish teams, including consideration of perspectives outside of the team and team members performing tasks normally outside of their roles. Table 1 provides examples of and summarizes observed behaviors using examples from the field notes, mapping these behavior characteristics onto the Lanham relationship characteristics. The distribution of relationship characteristics and scores for each team are shown in Table 2.

Correlation between relationship characteristics ranged from 0.32 to 0.95 (see Supporting Table 2 in the online version of this article). Mindfulness and trust are more highly correlated with each other than with other variables, as are diversity and respect. We performed a principal components factor analysis. Based on scree plot inspection and eigenvalues >1, we kept 3 factors that explained 85% of the total variance (see Supporting Table 3 in the online version of this article).

Our analyses of LOS and ULOS included 298 of the 576 patients. Two hundred sixty-seven patients were excluded because their entire LOS did not occur while under the care of the observed teams. Eleven patients were removed from the analysis because their LOS was >12 days. The analysis of complications included 398 patients. In our preliminary general linear modeling approach, only patient workload was significantly associated with outcomes using a cutoff of $P = 0.05$. Charlson-Deyo score and mental health comorbidities were not associated with outcomes.

The results of the Kruskal-Wallis test show the patient average ranking on each of the outcome variables by 3 groups (Table 3). Overall, teams with higher

TABLE 2. Team Relationship Profiles

Relationship Characteristic	Team										
	1	2	3a	3b	4a	4b	5	6	7	8	9
Trust	0	0	1	0	0	0	1	0	1	1	1
Diversity	0	1	1	1	0	0	0	0	1	1	1
Respect	0	1	1	1	0	1	0	0	1	1	1
Heedfulness	0	1	1	0	1	0	1	0	1	1	1
Mindfulness	0	0	1	0	0	1	1	0	1	1	1
Social/task relatedness	0	1	1	0	1	1	1	0	1	1	1
Rich/lean communication	0	1	1	0	0	0	1	0	1	1	0
Relationship score (no. of characteristics observed)	0	5	7	2	2	3	5	0	7	7	6

TABLE 3. Association Between the Teams' Number of Relationship Characteristics and Patient Outcomes

	No. of Relationship Characteristics		
	0-2	3-5	6-7
LOS, d, n = 293			
Median	4	5	3
IQR	5	4	3
Mean	4.7 (2.72)	4.7 (2.52)	4.1 (2.51), $P = 0.12^*$
ULOS, d, n = 293			
Median	0	0	0
IQR	0	0	0
Mean	0.37 (0.99)	0.33 (0.96)	0.13 (0.56), $P = 0.09^*$
Complications (per patient per day), n = 398			
Median	0	0	0
IQR	1	1	0
Mean	0.58 (1.06)	0.45 (0.77)	0.18 (0.59), $P = 0.001$ compared to teams with 0-2 or 3-5 characteristics

NOTE: Abbreviations: IQR, interquartile range; LOS, length of stay; ULOS, unnecessary length of stay.

*Not significant.

relationship scores had lower rank scores on all outcomes measures. However, the only statistically significant comparisons were for complications. Teams having 6 to 7 characteristics had a significantly lower complication rate ranking than teams with 0 to 2 and 3 to 5 ($P = 0.001$). We did not find consistent differences between individual teams or groups of teams with relationship scores from 0 to 2, 3 to 5, and 6 to 7 with regard to Charlson score, mental health issues, or workload. The only significant differences were between Charlson-Deyo scores for patients admitted to teams with low relationship scores of 0 to 2 versus high relationship scores of 6 to 7 (6.7 vs 5.1); scores for teams with relationship scores of 3 to 5 were not significantly different from the low or high groups.

Table 4 shows the Kruskal-Wallis rank test results for each group of relationship characteristics identified in the factor analysis based on whether teams displayed all or none of the characteristics in the factor. There were no differences in these groupings for LOS. Teams that exhibited both mindfulness and trust had lower ranks on ULOS than teams that did not have

either. Similarly, teams with heedfulness, social-task relatedness, and more rich communication demonstrated lower ULOS rankings than teams who did not have all 3 characteristics.

DISCUSSION

Relationships are critical to team function because they are the basis for the social interactions that are central to patient care. These interactions include how providers recognize and make sense of what is happening with patients, and how they learn to care for patients more effectively. Additionally, the high task interdependencies among inpatient providers require effective relationships for optimal care. In our study, inpatient medicine physician teams' relationships varied, and these differences were associated with ULOS and complications. Relationship characteristics are not mutually exclusive, and as our factor analysis demonstrates, are intercorrelated. Trust and mindfulness appear to be particularly important. Trust may foster psychological safety that in turn promotes the willingness of individuals to contribute their thoughts and ideas.¹³ In low-trust teams, providers may fear a negative impact for bringing forward a concern based on limited data. Mindful teams may be more likely to notice nuanced changes, or are more likely to talk when things just do not appear to be going in the right direction with the patient. In the case of acutely ill medical patients, trust and mindfulness may lead to an increased likelihood that clinical changes are recognized and discussed quickly. For example, on a team characterized by trust and mindfulness, the entire team was typically involved in care discussions, and the interns and students frequently asked a lot of questions, even regarding the care of patients they were not directly following. We observed that these questions and discussions often led the team to realize that they needed to make a change in management decisions (eg, discontinuing Bactrim, lowering insulin doses, adjusting antihypertensives, premedicating for intravenous contrast) that they had not caught in the assessment and plan portion of the patient care discussion. In another example, a medical student asked a tentative question after a patient needed to go quickly

TABLE 4. Association Between Inpatient Physician Team Relationship Characteristics and Outcomes

Patient Outcome	Mind/Trust		Diversity/Respect		Heed/Relate/Communicate	
	None	Both	None	Both	None	All 3
LOS, d, n = 293						
Median	4	4	4	4	4	4
IQR	5	3	4.5	3	4	4
Mean	4.7 (2.6)	4.2 (2.5)	4.7 (2.6)	4.3 (2.5)	4.4 (2.6)	4.4 (2.6)
P value		0.06*		0.23*		0.85*
ULOS, d, n = 293						
Median	0	0	0	0	0	0
IQR	0	0	0	0	0	0
Mean	0.39 (1.01)	0.15 (0.62)	0.33 (0.92)	0.18 (0.71)	0.32 (0.93)	0.18 (0.69)
P value		0.009		0.06		0.03
Complications (per patient), n = 389						
Median	0	0	0	0	0	0
IQR	1	0	1	0	1	0
Mean	0.58 (1.01)	0.19 (0.58)	0.47 (0.81)	0.29 (0.82)	0.26 (0.92)	0.28 (0.70)
P value	<0.0001			0.001		0.02

NOTE: Abbreviations: IQR, interquartile range; LOS, length of stay; ULOS, unnecessary length of stay.

*Not significant.

to the bathroom while they were examining her, leading the team to ask more questions that led to a more rapid evaluation of a potential urinary tract infection. This finding is consistent with the description of failure to rescue among surgical patients, in which mortality has been associated with the failure to recognize complications rapidly and act effectively.³³

Our findings are limited in several ways. First, these data are from a single academic institution. Although we sought diversity among our teams and collected data across 2 hospitals, there may be local contextual factors that influenced our results. Second, our data demonstrate an association, but not causality. Our findings should be tested in studies that assess causality and potential mechanisms through which relationships influence outcomes. Third, the individuals observing the teams had some knowledge of patient outcomes through hearing patient discussions. However, by involving individuals who did not participate in observations and were blinded to outcomes in assessing team relationships, we addressed this potential bias. Fourth, our observations were largely focused on physician teams, not directly including other providers. Our difficulty in observing regular interactions between physicians and other providers underscores the need to increase contact among those caring for hospitalized patients, such as occurs through multidisciplinary rounds. We did include team communication with other disciplines in our assessment of the relationship characteristics of diversity and rich communication. Finally, our analysis was limited by our sample size. We observed a relatively small number of teams. Although we benefitted from seeing the change in team relationships that occurred with attending changes halfway through some of our

data collection months, this did limit the number of patients we could include in our analyses. Though we did not observe obvious differences in relationships between the teams observed across the 2 hospitals, the small number of teams and hospitals precluded our ability to perform multilevel modeling analyses, which would have allowed us to assess or account for the influence of team or organizational factors. However, this small sample size did allow for a richer assessment of team behaviors.

Although preliminary, our findings are an important step in understanding the function of inpatient medical teams not only in terms of processes of care, but also in terms of relationships. Patient care is a social activity, requiring effective communication to develop working diagnoses, recognize changes in patients' clinical courses, and formulate effective treatment plans during and after hospitalization. Future work could follow several directions. One would be to assess the causal mechanisms through which relationships influence patient outcomes. These may include sensemaking, learning, and improved coordination. Positive relationships may facilitate interaction of tacit and explicit information, facilitating the creation of understandings that foster more effective patient care.³⁴ The dynamic nature of relationships and how patient outcomes in turn feed back into relationships could be an area of exploration. This line of research could build on the idea of teaming.³⁵ Understanding relationships across multidisciplinary teams or with patients and families would be another direction. Finally, our results could point to potential interventions to improve patient outcomes through improving relationships. Better understanding of the nature of effective relationships among providers should enable us to

develop more effective strategies to improve the care of hospitalized patients. In the larger context of payment reforms that require greater coordination and communication among and across providers, a greater understanding of how relationships influence patient outcomes will be important.

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