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Complexity Science and the Dynamics of Climate and Communication: Reducing Nursing Home Turnover

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Purpose: Turnover in nursing homes is a widespread problem adversely affecting care quality. Using complexity theory, we tested the effect of administrative climate, communication patterns, and the interaction between the two on turnover, controlling for facility context. ***Design and Methods:*** Perceptions of administrative climate and communication were collected from 3,449 employees in 164 randomly sampled nursing homes, and they were linked to secondary data on facility characteristics, resource allocation, and turnover. We used hierarchical regression to test the hypotheses. ***Results:*** Climate and communication both affected turnover, but lower turnover was dependent on the interaction between climate and communication. In nursing homes with reward-based administrative climates, higher levels of communication openness and accuracy explained lower turnover of licensed vocational nurses and certified nurse assistants, relative to nursing homes with an ambiguous climate. Adequate staffing and longer tenure of the nursing director were also important predictors of turnover. ***Implications:*** Although context is important, managers can also influence turnover by addressing climate and communication patterns and by encouraging stable nursing leadership.

Key Words: Management, Nursing research, Staffing, Environmental change, Manager tenure

Staff turnover in nursing homes is a widespread and serious problem resulting in poor resident outcomes (Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000). Turnover is estimated at 80% to 100% for certified nurse assistants (CNAs), at 40% to 70% for registered nurses (RNs) and licensed vocational nurses (LVNs; American Health Care Association, 2001), and at 44% for nursing home administrators (NHAs; Castle, 2001). Studies examining the relationship between facility context and nursing turnover have focused primarily on facility-level measures of structure, such as size and profit status, or on staff-level psychosocial measures, such as job satisfaction and perceived supervisory support (Tai, Bame, & Robinson, 1998). It is important that relatively few studies of nursing home turnover have considered attributes of management processes. Brannon, Zinn, Mor, and Davis (2002) found that an increased administrative span of control and unionized CNAs predicted low CNA turnover, and they found that high RN turnover predicted high CNA turnover. Anderson, Issel and McDaniel (1997) found that more administrative resources predicted lower RN and LVN turnover, and more RNs in the skill mix predicted lower CNA turnover. They also found that a lower workload predicted lower turnover among LVNs and CNAs. Banaszak-Holl & Hines (1996) found that greater CNA involvement in resident care planning explained lower CNA turnover rates. In this study, we explore the relationship between management practices and nursing staff turnover by measuring the influence of facility characteristics and the interactions among management practices on turnover. Because prior research has shown differences in predictors of RN, LVN, and CNA turnover (Anderson et al., 1997), we explore turnover of each group separately.

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Theoretical Background

Sheridan and colleagues (Sheridan, Hogstel, & Fairchild, 1990; Sheridan, White, & Fairchild, 1992) posited the concept of an administrative climate, defining it as "shared [staff] perceptions of administration's human resource management policies, practices, and procedures in a particular [nursing] home" (Sheridan et al., 1992, p. 335). They described climate as administrative procedures and practices of a whole organization that are the context within which work takes place (1990). They also distinguished between two primary types of climate: reward versus laissez-faire. In a reward climate, rewards are merit based, goals are clear, and relationships and employee welfare are important. In a laissez-faire climate, management is disorganized, rewards are status based, and conflict goes unresolved. Sheridan and associates (1992) found that nursing homes with a laissez-faire climate (i.e., higher scores on laissez-faire and status-oriented climate scales) had more care deficiencies than those with a reward climate (i.e., higher scores on human-relations climate scale). In 1990, Sheridan and colleagues found that supervisors demonstrating the same leadership behaviors influenced job performance of nursing staff in reward-climate homes but were rendered ineffectual in laissez-faire climate homes.

In this study, we propose that administrative climate is not a contextual variable as viewed in past research. The term *context* suggests that climate is the background against which other processes, such as communication, take place. Instead, we propose that climate is a set of management practices that are part of organizational processes that interact to create the whole. Specifically, we draw on the complexity science view of organizations as complex adaptive systems (Capra, 1996), in which the system contains multiple feedback loops, and agents organize and reorganize on the basis of nonlinear interaction and positive and negative feedback in a process called self-organization (Cilliers, 1998). Recognizing nonlinear interaction partially distinguishes complexity science from traditional systems theory.

Because the quality of the complex adaptive system is in the nature of connections and interactions, management practices facilitating the development of connection and interaction should lead to better outcomes (Stacey, 2001). Different patterns of interaction will occur in a reward climate than in a laissez-faire climate, influencing the ability of workers to develop relationships that increase the number and quality of interconnections and information flow. Specifically, because the reward climate emphasizes relationship and concern for employees, it should foster more effective self-organization and thus better outcomes. Because the laissez-faire climate is more concerned with status than relationship and is characterized by unresolved conflict, it should not foster effective self-organization, and thus outcomes in organizations with a laissez-faire climate would not be as good as those in organizations with a reward climate. Thus, our first hypothesis is as follows: Nursing homes in which the reward climate is dominant will have lower turnover than nursing homes in which the laissez-faire climate is dominant (Hypothesis 1).

Because self-organization relies on connection and nonlinear interaction, the nature of the communication processes in the organization will be important to effective self-organization. Managers may influence communication patterns by promoting or discouraging vertical and horizontal communication networks, thereby changing the rate of information flow between people and parts of the organization. Two studies suggest a link between organizational communication and turnover. Moen and Nievaard (1997) found that managers of hospitals and nursing homes with longer tenure had better communication skills than managers that had been terminated. Alexander (1988), in a study of hospital nursing units, found that communication (frequency of patient care conferences) was related to RN turnover. Three aspects of organizational communication patterns are considered in this study: openness (Roberts & O'Reilly, 1974), timeliness (Shortell, Rousseau, Gillies, Devers, & Simons, 1991), and accuracy (Roberts & O'Reilly, 1974). Openness is the extent to which one can speak clearly and directly without fear of repercussions or misunderstanding. Accuracy is the extent to which one believes that the information conveyed by other parties is correct (Roberts & O'Reilly, 1974). Timeliness is the degree to which information is relayed promptly to those who need it (Shortell et al., 1991). These aspects will influence the ability or willingness of workers to develop relationships that increase the number and quality of interconnections and information flow, contributing to effective self-organization and better outcomes. Thus, we form the following hypothesis: Nursing homes with higher scores for communication openness, timeliness, and accuracy will have lower turnover than nursing homes with lower scores (Hypothesis 2).

Self-organization is about patterns of relationship and connection and therefore is not dependent on any single management practice or organizational process. Thus, administrative climate is not a stagnant backdrop against which management practices occur. We propose, therefore, that the interaction between climate and communication will influence staff turnover. This relationship is suggested by the finding of Sheridan and colleagues (1990) of the "neutralizing" (p. 90) effect of the laissez-faire climate and the facilitating effect of reward climate on the relationship between leadership behaviors and job performance. Thus, we form our third hypothesis: There will be a significant interaction between climate and communication openness, timeliness, and accuracy, whereby the effect of communication on reducing

turnover will be enhanced in reward climates relative to laissez-faire climates (Hypothesis 3).

Methods

Sample and Overall Study Design

A sample of 380 Texas nursing homes was randomly selected to represent geographic, ownership, and racial distributions of the major metropolitan areas in Texas. We collected primary data by using a self-administered survey from the NHA, director of nursing (DON), RNs, LVNs, and CNAs in each nursing home in 1995. Of the 380 nursing homes sampled, 164 (43%) returned completed surveys from the NHA, DON, and nursing staff (244 RNs, 964 LVNs, and 2,317 CNAs). Most of the NHAs were female (57%), White (87%), and held a Bachelor's or higher degree (66%). Most of the DONs were female (91%), White (83.5%), and held less than a Bachelor's degree (67.5%). The majority of RNs (70%) and LVNs (59%) were White, whereas the majority of CNAs were non-White (71%).

We tested sample representativeness by using independent sample t tests for differences between values for nursing homes not in the study ($n = 854$) and the sample. We used Bonferroni's adjustment for increased Type I error rate that was due to multiple comparisons. There were no differences in scores for variables tested, including independent variables (case mix, owner type, size, occupancy, clinical resources, hours per resident day, and ratio of RNs) and dependent variables (RN, LVN, and CNA turnover). Thus, the sample represented Texas nursing homes on key study variables. We were not able to test for differences on communication and climate because we had no primary data for the population.

The survey contained closed-ended questions about the sociodemographic background of the employee and perceptions of management practices at that nursing home. Although a core set of questions was identical for surveys administered to all staff, customized modules were included for the RNs, LVNs, and CNAs regarding administrative climate and for the NHA and DON survey regarding environmental change. The focal unit of analysis of the study was the organization. Thus, the items in the measures of administrative climate and communication were anchored to the organization. The survey data were linked to data from Texas Medicaid nursing facility 1995 cost reports, from which we obtained measures of wage competition, case mix, ownership, size, occupancy, and turnover.

Variable Measurement

Table 1 shows means and standard deviations for all study variables. We tested all variables for skewness and kurtosis by using the Kolmogorov–Smirnov Test with an alpha level of $p < .001$, considered conservative in small to moderate size samples (Tabachnick & Fidell, 1989). If the level was significant, we used a natural log transformation in the analysis.

Table 1. Variable Means and Standard Deviations ($n = 164$)

Variable Name	*M*	*SD*
Turnover		
RN	116.53	133.7
LVN	113.88	91.62
CNA	170.51	114.27
Facility characteristics		
Composite case-mix index	.99	.09
Wage competition	1.00	.11
Owner type (% profit shown)	14.00	
Size (log)[a]	113.00	54.00
Occupancy (log)[a]	288.00	62.00
Perceived environmental change	2.55	.54
Manager characteristics		
NHA years of experience (log)[a]	9.42	8.83
Tenure of NHA (log)[a]	5.63	7.04
DON years of experience (log)[a]	5.85	6.50
Tenure of DON (log)[a]	2.70	4.14
Resource allocation		
Clinical resources (log)[a]	2.24	1.30
RN hours per resident day (log)[a]	.22	.13
LVN hours per resident day	.66	.22
CNA hours per resident day	1.85	.43
No. of RNs per total nursing staff (log)[a]	7.98	3.92
Perceptions of management practice		
Communication openness	3.57	.32
Communication timeliness	3.71	.28
Communication accuracy	2.91	.24
Reward administrative climate type[b]	45.00	

Notes: RN = registered nurse; LVN = licensed vocational nurse; CNA = certified nurse assistant; NHA = nursing home administrator; DON = director of nursing.
[a]Raw scores are shown for ease of interpretation.
[b]Ambiguous climate type = 0; reward climate type = 1 (% shown).

Dependent Variables: RN, LVN, and CNA Turnover

We estimated turnover separately for RNs, LVNs, and CNAs as an annual turnover rate. We calculated the rate by dividing the difference between the number employed during the fiscal year and the number employed at the end of year by the number employed at the end of the year. To facilitate interpretation, we multiplied the result by 100.

Independent Variables

We grouped independent measures into four domains: facility characteristics, manager character-

istics, resource allocation decisions, and perceptions of management practices. Facility characteristics included wage competition, ownership type, size, occupancy, administrative perceptions of external environmental change, and a composite measure of resident case mix. We defined wage competition as the extent of competition for RNs within the regional market, and we operationalized it as the ratio between the RN wage for a nursing home and the average RN salary for the region. We defined ownership type as the profit status of the facility, and we coded it as a dichotomous variable indicating nonprofit status. We defined size as the capacity to deliver services, and we operationalized it as the total number of Medicare or Medicaid licensed beds. We defined occupancy as the extent to which capacity to deliver services was utilized, and we operationalized it as the average number of days each bed was occupied in 1995. We defined perceived environmental change as the degree to which the facility's task environment changed during 1995, and we operationalized it through a summary scale score of NHA and DON perceptions of change in 37 elements of the task environment. Reliability and validity of the scale have been reported previously (Anderson & McDaniel, 1992). We defined the case-mix index as the weighted combination of the percentage of resident days in each of 11 TILEs (Texas Index of Level of Effort) obtained from the Medicaid Cost Reports (Texas Department of Human Services, 1995). We calculated the case-mix index by using a standardized formula designed for case-mix reimbursement (Texas Department of Human Services, 1995).

Facility manager characteristics included years of experience and tenure of the NHA and DON. We defined years of experience of the NHA and DON as the total number of years each spent in the position regardless of place of employment. We defined tenure of NHA and DON as the total number of continuous years each professional had been in his or her current position.

Resource allocation included staff hours per resident day, clinical resources available for resident care, and RN skill mix. We operationalized measures of RN, LVN, and CNA hours per resident day as the ratios of hours worked to the total number of resident days. We defined the clinical resources variable as the availability of RNs for clinical leadership in planning and managing resident care, and we calculated it as the ratio of RN full-time equivalents (FTEs) to 60 beds, adjusted for occupancy. We defined skill mix as the level of RN supervisory attention available, and we operationalized it as the ratio of RN FTEs to total nursing staff FTEs.

We defined perceptions of management practices to include perceptions of communication patterns and administrative climate. We measured perceptions of communication patterns by using five, 5-point scale items of openness of communication (Roberts & O'Reilly, 1974); five, 5-point scale items of accuracy of communication (Roberts & O'Reilly, 1974); and four, 5-point scale items of timeliness of communication (Shortell et al., 1991). The scales' reliability and validity in measuring the three dimensions of communication have been demonstrated in prior research (O'Reilly & Roberts, 1977; Roberts & O'Reilly, 1974; Shortell et al., 1991). In our study, factor analysis with varimax rotation explained 55% of the variance and provided construct validity for the three dimensions. After one item (delays in care information relay) was dropped from the timeliness scale, the remaining 13 items loaded on the expected factors with loadings between .65 and .78 (complete results are available from first author). Reliability alpha coefficients were .81, .68, and .72 for openness, timeliness, and accuracy, respectively.

We measured perceptions of administrative climate by using a scale originally developed by Pritchard and Karasick (1973) and modified for health care organizations with adequate reliability and validity by Sheridan and colleagues (1990, 1984). We measured two climate dimensions in this study: reward and laissez-faire. Of the original 28 items (14 reward climate items and 14 laissez-faire items), 2 reward items (interest in employee welfare and frequent feedback) and 4 laissez-faire items (poor orientation, low expectations, poor planning, and treat all workers as equals) were dropped because they did not load appropriately on a factor or because they substantially reduced reliability coefficients. A factor analysis with varimax rotation of the retained 22 items explained 48% of the variance. Loadings on expected factors between .44 and .77 supported the reward and laissez-faire dimensions found by Sheridan and colleagues (1990; complete results available from first author). Reliability coefficients were .90 for reward climate and .85 for the laissez-faire climate.

Because we were interested in the shared perceptions of management practices within each facility, we aggregated communication and climate scores to the nursing home level. We established that the measures were meaningful at that level by using the eta-squared coefficient (η^2), which estimates the proportion of variance that is due to organizational membership (Joyce & Slocum, 1984). The values were $\eta^2 = .13$ (communication openness), $\eta^2 = .10$ (communication timeliness), $\eta^2 = .9$ (communication accuracy), $\eta^2 = .13$ (reward climate), and $\eta^2 = .12$ (laissez-faire climate), which Joyce and Slocum (1984) suggested are large enough for meaningful aggregation.

Using the strategy of Sheridan and associates (1990), we clustered nursing homes to establish two groups that had dissimilar climates. Using the Quick Cluster routine in SPSS for Windows (version 10; Norusis, 1993), we identified two groups of nursing homes that had the greatest difference in their reward and laissez-faire climate scores (Table 2). The Quick Cluster procedure allows for the a priori specification

Table 2. Analysis of Variance Results

Climate Subscale	Nursing Home: Ambiguous Climate M (SD)	Nursing Home: Reward Climate M (SD)	F	η^2
Laissez-faire climate scores	2.93 (0.17)	2.56 (0.23)	137.22*	.46
Reward climate scores	3.19 (0.19)	3.58 (0.21)	154.90*	.49

Notes: Table shows comparisons of scores on administrative climate subscales between the ambiguous climate and reward-climate facilities. The ambiguous climate is coded as zero ($n = 90$); the reward climate is coded as one ($n = 74$).
*$p < .0001$.

of the number of clusters in the data but does not require specification of initial cluster centers. In the first cluster ($n = 90$), mean scores suggested that employees in these nursing homes did not strongly identify with either laissez-faire or reward-climate typologies. Rather, both mean scale scores were close to 3.00 (Table 2), the midpoint of each scale suggesting that the administrative climate in these nursing homes was ambiguous with regard to classification. Thus we relabeled the cluster "ambiguous" climate. In contrast, the mean scores for nursing homes in the second cluster ($n = 74$) showed greater differentiation between laissez-faire and reward climates. Specifically, the facilities in this cluster rated the climate as more likely to be reward than laissez-faire, and thus we labeled the cluster "reward" climate. We constructed a dichotomous variable and set it to zero if the facility was classified in the "ambiguous" climate and set it to one if the facility was classified in the reward climate. Analysis of variance results confirmed that reward-climate facilities had statistically significantly lower laissez-faire scores and higher reward scores than the ambiguous climate facilities.

Data Analysis

We analyzed RN, LVN, and CNA turnover in three separate models. In a data-reduction step, we regressed RN, LVN, and CNA turnover on facility and manager characteristics and resource-allocation variables (identified in Table 1) by using forward, stepwise analyses; we eliminated from further analysis all variables that were not significant. Because we included only context variables significant in each model, RN, LVN, and CNA results

Table 3. Hierarchical Regression Results: RN Turnover ($n = 164$)

Variable	Model 1 β	Model 1 SE	Model 2 β	Model 2 SE	Model 3 β	Model 3 SE
Facility characteristics						
Composite case-mix index	116.68	74.28	124.00	74.83	121.17	76.32
Environmental change	31.50**	12.38	33.49***	12.54	33.18**	13.03
Administrative characteristics						
Log DON tenure	−16.76***	5.07	−16.12***	5.36	−16.21***	5.48
Resource allocation						
Log RN hours per resident day	31.29*	13.91	31.29**	13.91	32.15**	14.40
LVN hours per resident day	−52.30****	30.02	−53.15*	30.38	−51.25*	31.04
Log clinical resources	−81.79**	13.76	−80.76****	14.38	−81.13****	15.12
Nursing staff perceptions of communication						
Communication openness			23.83	30.06	23.91	36.58
Communication accuracy			24.67	30.61	40.27	42.06
Communication timeliness			−38.41	33.45	−38.32	40.79
Nursing staff perceptions of administrative climate						
Reward climate					−2.73	16.35
Interaction terms						
Communication openness × Reward climate					.64	15.07
Communication accuracy × Reward climate					−2.26	14.13
Communication timeliness × Reward climate					−6.77	12.57
Constant	54.23	89.36	28.62	136.15	−11.22	172.70
F	11.53****		7.85****		5.32****	
F change			.65		.10	
R^2	.32		.33		.33	
Adjusted R^2	.29		.29		.27	

Note: DON = director of nursing; RN = registered nurse; LVN = licensed vocational nurse.
*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

Table 4. Hierarchical Regression Results: LVN Turnover ($n = 164$)

Variable	Model 1 β	Model 1 *SE*	Model 2 β	Model 2 *SE*	Model 3 β	Model 3 *SE*
Facility characteristics						
Composite case-mix index	78.36	72.53	84.43	72.86	92.27	72.03
Environmental change	40.37***	12.23	39.25***	12.33	33.58***	12.44
Size	−32.42**	14.58	−28.24*	15.48	−30.50*	15.53
Administrative characteristics						
Log DON tenure	−9.63*	4.97	−9.10*	5.22	−10.87*	5.18
Resource allocation						
LVN hours per resident day	−63.51**	29.51	−59.45**	29.72	−63.94**	29.40
Log clinical resources	−35.32**	13.94	−36.72**	14.05	−26.49*	14.32
Log RN hours per resident day	26.31*	13.42	28.71**	13.55	22.27	13.62
Perceptions of communication						
Communication openness			45.44	29.94	84.88**	35.35
Communication accuracy			−26.85	29.98	−31.33	39.98
Communication timeliness			−20.70	32.57	11.56	38.56
Perceptions of administrative climate						
Reward climate					.39	15.68
Interaction terms						
Communication openness × Reward climate					−38.99***	14.22
Communication accuracy × Reward climate					−25.64*	13.42
Communication timeliness × Reward climate					−3.65	11.85
Constant	194.74*		167.21		−65.33	
F	5.50****		4.11****		3.71****	
F change			.89		3.00**	
R^2	.21		.22		.27	
Adjusted R^2	.17		.17		.20	

Note: DON = director of nursing; RN = registered nurse; LVN = licensed vocational nurse.
*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

show slightly different sets of contextual variables. The appendix describes the implications of this data-reduction choice. After we reduced the data, we tested the hypotheses by using hierarchical regression with forced entry of variables in blocks. We used three models to test the hypotheses. Model 1 tested turnover regressed on the context variables. Model 2 tested turnover regressed on communication, while controlling for context. Model 3 tested turnover regressed on climate type and the Climate type × Communication interaction, while controlling for communication and context variables.

Results

Regression Models

Results of the RN models (Table 3) indicated that RN turnover was explained by facility characteristics, administrative characteristics, and resource-allocation variables and that these results were stable across the three models (Models 1 to 3). Adding the communication and climate variables did not increase explained variance in RN turnover (Models 2 and 3). Greater perceived environmental change was related to higher RN turnover. Longer tenure of the DON was related to lower RN turnover, and the standardized coefficients indicated that DON tenure was one of the strongest relative predictors of RN turnover. In terms of resource allocation, greater availability of clinical resources was the strongest predictor of lower RN turnover. Interestingly, whereas greater LVN hours per resident day was significantly related to *lower* RN turnover, greater RN hours per resident day was significantly related to *higher* RN turnover. Allocation of CNA resources did not relate to RN turnover.

LVN model results (Table 4) show that the strength and significance of the measures of facility context remained stable across all three models (Models 1–3). Two facility characteristics, environmental change and size, explained LVN turnover. Greater perceived environmental change was related to higher LVN turnover, and larger size was related to lower LVN turnover. Of the administrative characteristics, longer tenure of the DON was related to lower turnover rates, consistent with the RN results (Table 3). Of the resource-allocation variables, LVN hours per resident day and clinical resources explained significant variance in LVN turnover across the three models (Table 4). Greater LVN hours per resident day and greater availability of clinical resources were related to lower LVN turnover.

Table 5. Hierarchical Regression Results: CNA Turnover ($n = 164$)

	Model 1		Model 2		Model 3	
Variable	β	*SE*	β	*SE*	β	*SE*
Facility characteristics						
Composite case-mix index	93.43	83.63	98.63	84.11	103.75	81.67
Environmental change	57.46****	13.45	56.05****	13.72	55.81****	13.61
Administrative characteristics						
Resource allocation						
CNA hours per resident day	−57.08***	17.16	−54.01***	17.53	−57.96***	17.16
Perceptions of communication						
Communication openness			22.17	34.31	36.22	40.24
Communication accuracy			.81	34.87	−4.14	45.59
Communication timeliness			−51.46	37.28	−29.93	44.41
Perceptions of administrative climate						
Reward climate					50.62***	17.73
Interaction terms						
Communication openness × Reward climate					−39.64**	15.95
Communication accuracy × Reward climate					−34.84**	15.40
Communication timeliness × Reward climate					−8.14	13.65
Constant	31.17		133.71		12.65	
F	9.74****		5.19****		4.80****	
F change			.70		3.02**	
R^2	.16		.17		.25	
Adjusted R^2	.14		.14		.19	

Note: CNA = certified nurse assistant.
$p < .10$; $^{**}p < .05$; $^{***}p < .01$; $^{****}p < .001$.

Adding administrative climate and communication openness, accuracy, and timeliness to the model (Table 4, Model 3) significantly improved our ability to explain LVN turnover. Notably, these predictors had the strongest relative effects on LVN turnover of all significant predictors in the model and showed important direct and interactive effects. Climate type did not have a significant direct effect on LVN turnover. However, the interaction terms for Climate × Communication openness and Climate × Communication accuracy did significantly explain LVN turnover (Model 3). Greater openness of communication in the reward-climate nursing homes explained lower LVN turnover relative to nursing homes with an ambiguous climate. Similarly, greater accuracy of communication within a reward climate explained lower LVN turnover. Furthermore, when climate type and the interaction terms of Climate × Communication were controlled for, communication openness had a direct, significant effect on LVN turnover (Model 3). Greater openness in communication explained higher LVN turnover rates.

Results of the CNA models indicated that, of the context measures, only two indicators explained CNA turnover—environmental change and CNA hours per resident day—and these effects remained constant across all three models (Table 5). A perception of greater environmental change was related to higher CNA turnover, consistent with the results for RN and LVN turnover models. Greater CNA hours per resident day was significantly related to lower CNA turnover. Adding administrative climate and communication variables to the models substantially increased explained variance in CNA turnover (Models 2 and 3). Relative to facility context variables, the effects of climate and communication on turnover were greater for CNAs than for RNs and LVNs. In the CNA models, R^2 changed from .16 to .25 (Table 5) compared with a change from .32 to .33 in the RN models (Table 3) and a change from .21 to .27 in the LVN models (Table 4). Climate had both direct and interactive effects on CNA turnover. Specifically, facilities in the reward climate had higher CNA turnover rates. This effect remained even when communication and the interaction terms (Climate × Communication openness and Climate × Communication accuracy) were controlled for in Model 3 (Table 5). Finally, both interaction terms explained significant variance in CNA turnover, similar to the LVN models. Higher levels of communication openness and accuracy in reward-climate facilities were related to lower levels of CNA turnover, relative to those facilities in the ambiguous climate.

An examination of trends indicates that facility context contributed the most to explained variance in each final model. Measures of facility character-

istics, manager characteristics, and resource allocation explained 100% of the explained variance in RN turnover, 85% of the explained variance in LVN turnover, and 74% of explained variance in CNA turnover. It is important that shared perceptions of the administrative climate, and the joint effects of climate with shared perceptions of communication patterns, significantly contributed to explaining LVN and CNA turnover. For both LVNs and CNAs, the inclusion of the interaction terms of Climate × Communication significantly increased explained variance in turnover.

Results indicate mixed support of the research hypotheses. First, including climate type in the models did not significantly improve our ability to explain RN and LVN turnover but did improve our ability to explain CNA turnover. However, the direction of the effect of climate on CNA turnover did not support Hypothesis 1. Second, when we entered the measures of perceptions of communication openness, accuracy, and timeliness into the model as a block (Tables 3–5, Model 2), *F* tests of significance for the block of predictors indicated that perceptions of communication did not significantly improve our ability to explain turnover. Moreover, no individual measures of communication were significant before climate type was controlled for. Thus, Hypothesis 2 was not supported. Third, the final models indicated that the interaction terms of Climate × Communication openness and accuracy significantly improved our ability to explain LVN and CNA turnover (Tables 4 and 5, Model 3), supporting Hypothesis 3.

Discussion

The purpose of this study was to explore the influence of management practices on staff turnover in nursing homes. In an attempt to look beyond contextual variables such as facility characteristics, manager characteristics, and resource allocation, we viewed nursing homes as complex, adaptive systems, suggesting that effectiveness is a function of the patterns of relationship, including the degree of connection and interaction, in the nursing home. To that end, we studied the effect of staff perceptions of administrative climate and communication patterns on RN, LVN, and CNA turnover in 164 nursing homes.

First, we hypothesized that nursing homes in which staff perceived a reward climate would have lower turnover than nursing homes in which staff perceived a laissez-faire climate. When the nursing homes in this sample were clustered into two groups with the greatest difference between scores, we found that one group perceived reward climate as dominate. The other group was not predominately laissez-faire; rather, scores indicated ambiguity about climate type. Thus, we were not actually able to test the hypothesis comparing the reward with the laissez-faire climate. Rather, we tested differences between a reward climate and an ambiguous climate. We found that the type of climate was not significantly related to RN or LVN turnover. In contrast, we found that climate was related to CNA turnover in a direction that was opposite our expectation, and thus Hypothesis 1 was not supported. Specifically, CNA turnover was higher in homes where staff perceived a reward climate than in homes where staff perceived an ambiguous climate. This suggests that, for CNAs, a reward climate may create greater turnover because the clarity of roles, goals, and feedback may be linked to authoritarian management styles, and concern for employee welfare on and off the job may be viewed as paternalistic (Janssens, Brett, & Smith, 1995; Motwani, Hodge, & Crampton, 1995). This is a likely explanation in light of the fact that NHAs and DONs are primarily White, and CNAs are primarily non-White, so the cultural differences may affect interpretations of administrative behaviors (Janssens et al., 1995). This is a question for future research. The CNAs in the ambiguous climate may view the administration more positively because it may end up seeming more "hands off."

Second, we hypothesized that greater levels of perceived communication openness, accuracy, and timeliness would explain lower staff turnover. This hypothesis was not supported. When context was controlled for, the communication variables did not explain turnover for any group of staff. The lack of support for this hypothesis suggests that the patterns of communication alone neither create effectiveness nor ineffectiveness.

Third, we hypothesized that interaction between climate type and communication patterns would explain lower turnover. We suggested that because self-organization is about patterns of relationship and connection; it is the product of the interaction among multiple processes, such as climate and communication, that increase the information flow, increase and improve the quality of connection among people, and provide for a greater diversity of thought and action (Stacey, 1996). This hypothesis was supported for LVN and CNA turnover, but not for RN turnover. We found that for both LVNs and CNAs the interaction terms between type of climate and communication openness and accuracy were related to turnover. Specifically, in nursing homes with a reward climate, greater communication openness and accuracy were related to lower turnover, relative to nursing homes in the ambiguous climate. In addition, we found that when the interaction terms were in the model, higher LVN turnover was related to greater openness of communication. These findings provide support for the notion that patterns of relationships are important. Communication openness in and of itself had a negative impact on LVN turnover. It is possible

that being open, that is, saying what one means, may lead to misunderstandings or be offensive or hurtful. In contrast, in combination with a reward climate, open and accurate communication is interpreted in light of the apparent concern for employee welfare and clear performance expectations. That the hypothesis was not supported for RNs may be due to the RNs' supervisory role in nursing homes. RNs may view themselves as part of the administration and thus do not relate to management practices in the same ways as LVNs and CNAs.

The finding by Sheridan and colleagues (1990) that interaction between climate and leadership behaviors explained job performance is consistent with the results of our study. Prior research, however, views climate as static and determined by NHAs. However, complexity science would suggest that administrative climate is emergent. Although NHAs and DONs may have intentions about creating a certain type of climate, what emerges is the result of managers' intentions in combination with perceptions, reactions, and communication patterns among organizational members. Future research might explore this emergent property by using a longitudinal design. Further, we found climate to be a set of fundamental management practices that interact with communication patterns to create an important picture that is not detectable when practices are viewed in isolation. Consequently, the notion of administrative climate may be misleading in that all levels of staff participate in interactions that form the realized patterns.

Results of this study also emphasize the importance of understanding the influence of contextual factors such as environmental change, nursing home size, DON tenure, and decisions about staffing. We found these factors to be critical to turnover, accounting for an overwhelming proportion of explained variance in turnover. Complexity science suggests that contextual factors are as important as internal dynamics because systems continually interact with environments in a process of coevolution, with each changing the other (McDaniel & Driebe, 2001).

First, this research clearly shows the importance of the DON to workforce stability in nursing homes. The tenure of the DON was a strong predictor of lower turnover among RNs and LVNs. When a DON leaves a nursing home, licensed nurses may go with the DON to another setting or may view the leadership transition as a good time to leave. In addition, it is possible that with longer tenure in the job, a DON is better able to connect with staff, to foster job commitment, and to learn more about the organization and its nurses for more effective management. This finding has implications for upper level managers who often remove a DON as the scapegoat after a negative organizational outcome, such as a state inspection (Angelelli, Gifford, Shah, & Mor, 2001), especially in light of recent research that links DON tenure to better resident outcomes (Anderson et al., 2003). The finding has implications not only for the hiring process but for reward systems and structural aspects of the job. Exploring these and other factors that may influence DON retention is a vital area for future research.

Second, we found that the pattern of resource allocation was a key factor in explaining turnover. Specifically, lower RN and LVN turnover was explained by greater availability of clinical resources (RNs) and by higher LVN hours per resident day. This suggests that RNs and LVNs are more comfortable when there is a sufficient cadre of RNs, who are the primary source of clinical leadership in nursing homes, and sufficient LVN-to-patient ratios. These findings are consistent with prior research (Anderson et al., 1997). Interestingly, we found that higher RN hours per resident day had a weak relationship to higher RN turnover, in contrast to notions about the effect of workload on turnover and a prior study that found no relationship between RN workload and RN turnover (Anderson et al., 1997). As RN hours per resident day are strongly associated with the acuity of illness and dependency of residents, this finding could be an artifact of case mix, which may not be sufficiently controlled by the payment case-mix index. Thus, the finding may indicate that RN turnover is higher in nursing homes with sicker and more dependent residents, consistent with prior research (Anderson et al., 1997). CNA turnover was also found to be lower in homes with higher CNA hours per resident day, consistent with prior research (Anderson et al., 1997). A potential explanation is that when CNA hours per resident day are higher, CNAs are more likely to feel greater satisfaction in being able to take time to do a good job and to spend time with residents. This explanation is consistent with the findings of Bowers, Esmond, and Jacobson (2000) that CNAs were happier when they felt they were doing a good job, did not have to cut corners in providing care, and had time to interact with residents.

Third, facility size and environmental change both affected turnover. Larger nursing homes had less RN turnover, consistent with past research (Anderson et al., 1997). Managers cannot do much to change the size of a nursing home, and thus the finding suggests that managers in smaller nursing homes need to pay extra attention to the factors that they have some control over, such as staffing levels, to reduce turnover. Environmental change predicted turnover of all three groups of staff. Again, this is a factor that managers cannot control; however, together managers and staff can make sense of change. Prior research shows that organizations that interpret environmental events as threats do not do as well as those that interpret events as nonthreatening (Torkelson, Anderson, & McDaniel, 1996). There-

fore, encouraging staff to discuss environmental change and to develop positive interpretations and responses might be helpful.

We acknowledge that our study has limitations. We cannot make statements about causation because of the correlational design. The study included nursing homes from only one state, and therefore, generalizations should be made cautiously. Further, data-reduction strategies constrained our ability to fully explore the effects of the contextual variables (e.g., wage competition and ownership) that were eliminated in the stepwise regression but that may have had subtle effects if they had been allowed to enter in the full hierarchical regression.

The results of this study suggest that management practice in nursing homes is not a simple matter. Our traditional Newtonian ways of thinking about management lead us to expect simple cause and effect relationships in which small causes lead to small effects and big causes lead to big effects. It also fosters the belief that we can reduce a situation to its parts and study factors in isolation (McDaniel & Driebe, 2001). This research demonstrated that this mode of thinking is misleading. Causes and effects are related in complicated ways, with the interaction among elements being particularly important. Future research should consider the interaction among management practices as potentially more potent predictors of outcomes. It is likely that some relationships in this study are nonlinear and have to be studied as such in future research.

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Appendix

Because we included slightly different contextual variables in the different regression models for RN, LVN, and CNA turnover, we were concerned that uncontrolled confounding variance may have influenced the differences in results for the three groups (Tables 3–5). To test for confounding influence, we reran the full regression model (i.e., Model 3) with an identical block of contextual variables including all predictors that were identified as significant in one or more of the RN, LVN, and CNA forward, stepwise regression results. In addition, we included competition and profit status regardless of statistical significance because of the potential for undercontrolled confounding factors. It is important that the results of this analysis indicated that the inclusion of the additional variables made no difference in the significance, magnitude, and direction of findings for communication and climate on RN, LVN, or CNA turnover. Moreover, the inclusion of the additional variables did not alter the relative

importance of contextual variables in relation to climate and communication or the overall R^2 value for the LVN and CNA models, and R^2 increased by only 1% in the RN model. Therefore, we judged that the slight differences in the context variables between RN, LVN, and CNA models did not influence the results related to the tested hypotheses and justified the use of the reduced models. The complete results are available from R. Anderson.