Symposium/Forum
TITLE
Is there an Organizational Scientist in the House?: How the Science of I-O is Helping Healthcare Enter a New Era

ABSTRACT
This session presents a comprehensive view of recent I-O research dedicated to addressing some of the most pressing challenges facing healthcare today, including: wide-scale organizational change, integration of new training and education models, implementation and adoption of new technology, and the need to rapidly develop a culture of safety.

PRESS PARAGRAPH
As a professional community rooted in evidence-based practice, healthcare demands robust study of organizational change and development strategies. Organizational scientists are helping healthcare to enter a new era characterized by evidence-based intervention and implementation strategies. This symposium presents state-of-the-art findings regarding simulation-based training, workplace support mechanisms for technology adoption and process change, and diagnostic strategies for patient safety climate measurement. Presenters address relevant questions regarding factors moderating the impact of these strategies to bring a theoretically meaningful discussion of organizational change and training, and practically meaningful guidance to practitioners who draw on the science to support evidence-based intervention within healthcare.
General Session Summary:

Is there an Organizational Scientist in the House?: How the Science of I-O is Helping Healthcare Enter a New Era

Sallie J. Weaver, Ph.D., Chair
Johns Hopkins School of Medicine

As a professional community rooted in evidence-based practice, healthcare demands robust study of organizational change and development strategies. Organizational scientists are helping healthcare to enter a new era characterized by evidence-based intervention and implementation strategies. Organizational change, implementation strategies, team-training and individual skill development have been topics of organizational science for over 50 years; however, our understanding continues to grow as the science progresses in both content foci and methodology.

This symposium goes beyond traditional paradigms of organizational research to present state-of-the-art findings regarding simulation-based training, workplace support mechanisms for technology adoption and process change, and diagnostic strategies for patient safety climate measurement. Presenters address relevant questions regarding factors moderating the impact of these strategies within the complex context of healthcare organizations in order to bring a theoretically meaningful discussion of organizational change and training, and practically meaningful guidance to practitioners who draw on the science to support evidence-based intervention within healthcare.

The flow of the symposia moves through multiple-levels of analysis, beginning with individual and team-level studies and ending with unit-level and organizational-level studies. The first half examines individual and team-level development strategies. The second half is dedicated to a unit-level study of patient safety climate and patient outcomes, as well as a study of the impact of organizational support mechanisms on the relationship between use of alert notification systems and employee outcomes.

As the first presenter, Rebecca Lyons (University of Central Florida) presents a series of three studies examining a clinical simulation-based training program for medical students. Practice scenario design (individual vs. group) and placement in the curriculum were manipulated. Results are discussed in terms of both future research needs and practical implications of training research in healthcare.
Our second presenter, Marina Pearce (Michigan State University), discusses an experimental study examining simulation-based team-training. In this controlled study, teams of four to six medical residents completed simulated patient care cases after participating in either team process training or a placebo program. Measures include observed team performance, team composition (demographics, personality), team cognitive and motivational processes (team mental models, team efficacy), and perceived team effectiveness.

Our third presenter, Sallie J. Weaver (Johns Hopkins School of Medicine) presents a study focused on patient safety climate that examined (1) the antecedents that impact individual patient safety climate perceptions and (2) the relationships between hospital unit patient safety climate and two important unit-level outcomes: patient willingness to recommend a facility to others and patient safety. This study tested a theoretical model of patient safety climate by examining the configural nature of the construct in terms of climate shape, elevation, and variability (e.g., Joyce & Slocum, 1984; Schulte et al., 2009). Results indicated that the configural climate characteristics differentially predicted clinician and patient outcomes.

Finally, Sylvia J. Hysong (Houston VA Health Services Research & Development Center of Excellence, Baylor College of Medicine) discusses a study examining the effects of workplace support systems on clinician job satisfaction and turnover intentions in relationship to use of alert notification systems (ANS) used as part of an Electronic Health Record (EHR). The transition from the paper-based medical record to electronic charting and record systems is a significant organizational and cultural change that faces the healthcare community. ANS are one part of EHRs designed to notify providers of test results in real time; however, such systems can hamper workflow, leading to dissatisfaction and stress for providers (Poon et al., 2004). This study focuses on the degree that different workplace support systems (e.g., training, monitoring/feedback on ANS use, supportive ANS use norms) impact job satisfaction, intentions to quit, and ultimately turnover.
In closing, Michael A. Rosen (Johns Hopkins School of Medicine) will offer a discussion of the integrative themes across the four studies and offer insight into the future directions for study of organizational processes within healthcare. His perspective is particularly critical given his focal work on enhancing patient safety and care quality through simulation-based training, team-training, and organizational change initiatives. Given that his research appears in the Journal of Management, Human Resource Management Review, Human Factors, Academic Medicine, Simulation in Healthcare, and the Joint Commission Journal on Quality and Patient Safety, we are confident that Dr. Rosen will offer an insightful discussion integrating themes across the four studies and providing ideas for future directions in both science and practice.
References


Optimizing Simulation Using Virtual Patients with Complex Neurologic Conditions

Rebecca Lyons, M.S.
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Benjamin Lok, Ph.D.
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Simulation is increasingly recognized as a valuable tool for medical education (Bradley, 2006). Effectively designed and implemented simulation exercises can facilitate learning, and provide standardized, pre-real-world exposure to medical concepts without risk to either students or patients (Issenberg et al., 1999). In addition to the direct educational benefits promoting the implementation of simulation within medical curriculums, recent modifications to the accreditation standards for all undergraduate medical education programs leading to the M.D. degree, have also encouraged simulation use. Specifically, standards now mandate medical colleges specify the types of clinical conditions to which students will be exposed, and that if for any reason exposure to a clinical condition through patient encounters is not possible, the college “be able to remedy the gap by a simulated experience…or in another clerkship” (LCME, 2011, p. 7).

Under these accreditation standards, one area in which medical colleges have struggled to provide either real-life or simulated exposure is in the diagnosis of abnormal neurological conditions, such as cranial nerve (CN) palsies – serious but relatively uncommon disorders. Due to the rare presentation of CN palsies, direct patient exposure is sporadic or absent in medical education. Adding complexity for educators, commonly utilized simulation modalities are insufficient for representing these conditions. Patient symptoms indicative of CN palsies are impossible for standardized patients to reproduce, and are not addressed by existing mannequin
or physical simulators. To fill this important educational role, researchers created the Neurological Exam Rehearsal Virtual Environment (NERVE) system, a PC based simulation which allows learners to practice assessment of abnormal CN clinical presentations in a virtual medical office. Based on the information required for diagnosing CN palsies, NERVE was developed to allow for two primary functions: (1) dialog between the VP and user, and (2) performance of a physical examination.

This paper presents three studies involving the implementation of NERVE within a medical education curriculum. The objective of these studies was to obtain information regarding students’ experiences using NERVE and to better understand how NERVE can optimally be utilized within the educational curriculum. Specifically, we sought to validate NERVE as a learning tool, optimize curricular placement, and examine how practice context (i.e., group versus individual performance, lab activity versus take-home) may influence learning. Studies were conducted iteratively with three consecutive cohorts.

In Study 1, 39 medical students received exposure to NERVE simulations at the end of their second year within a course lab activity. This study manipulated individual versus small-group participation. Measures were administered to capture declarative and translational knowledge (i.e., diagnosis of video clips) development, system usability, and user reactions.

Study 1 reaction and usability data indicated overall satisfaction with the NERVE system. Cumulatively, these results indicated the current simulation placement was not providing the desired level of challenge or learning benefit. Users reported low mental effort requirements, scored highly on declarative knowledge at both pre- and post- test, and indicated they would prefer earlier exercise placement. Comparison of group and individual simulation performance and learning did not indicate significant differences.
Based on these findings, the research design was replicated in Study 2 ($N=57$) with two significant changes: the simulation activity was moved to the beginning of the second-year and, NERVE case feedback was enhanced. Results indicated a substantial drop in declarative knowledge pre-test scores, but significant improvements in declarative and translational knowledge following NERVE exposure. This suggested improved curricular placement; however, students indicated a preference for first-year placement. Deployment as a group or single-user activity had a greater effect on learning outcomes compared to Study 1.

A third study scheduled for early spring will place the NERVE simulation activity proximate to the introduction of CN within the first-year curriculum. This study will further explore the issues of optimal curriculum placement, and implementation factors which moderate the effectiveness of the simulation, team and individual performance, and student’s reactions to the exercise. Specifically, participation in the simulation within a scheduled, in-lab session, versus a take home session will be examined.

Our data highlight the sensitivity of the timing of simulation placement within a curriculum and suggests that individual versus group participation may impact learning within these short term, isolated learning activities, especially for trainees with less experience. Also, in the future development of virtual patient scenarios, utility for senior students may be enhanced by adding requirements for identifying the underlying cause of abnormalities and formulating a treatment plan, rather than basic condition recognition and diagnosis. Finally, to understand the impact of clinical simulations on student learning, future research must also assess transfer to real-world settings.
References


Enhancing Emergency Medical Team Performance via Team Process Training

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Organizational scientists have long considered process failures to be some of the most significant threats to stable team functioning. This knowledge is especially important for emergency medical teams who work in ambiguous, unpredictable, stressful environments, and whose actions are literally “life and death.” In fact, hundreds of thousands of in-hospital deaths are related to preventable human medical errors each year (HealthGrades, 2008). Through the application of our field’s understanding of team processes (e.g., coordination, leadership), we can offer evidence-based, theoretically-driven training and assessment tools to assist in
preventing such errors. Thus, the ultimate purpose of our research is to use team process training to help emergency medical teams perform more safely and effectively.

To date, team process dynamics research has most often taken place in the laboratory, using student samples engaging in low-fidelity tasks (e.g., Acar, 2010; Lin, Yang, Arya, Huang, & Li, 2005; one exception is Klein, Ziegert, Knight, & Xiao, 2006). It is currently unclear how generalizable findings stemming from that research are to action teams like emergency medical teams. Our research uses an alternative method to investigate the operations and processes of these units, maintaining the precision of the laboratory and enhancing the fidelity of the research with regard to our population of interest (emergency medical doctors). Specifically, we study medical students and residents engaging in high-fidelity emergency room simulations as part of their professional training. Recent work by Hunziker and colleagues (e.g., 2011) supports the usefulness of a similar paradigm in studying teamwork and performance. In addition to testing the benefits of team process training in emergency medical teams, our presentation will describe our high-fidelity approach to the design, validation, and implementation of emergency medical team simulations.

In the current study, 46 teams comprised of four to six medical students and residents engaged in two simulated emergency medical scenarios (with the help of one nurse confederate). Each scenario lasted around 20 to 30 minutes. Before engaging in the scenarios, half the participating teams were trained to understand and apply the team processes identified by Marks and colleagues (2001; see Figure 1); the other half were given placebo training. Our goal was to show that teams trained on team process skills would demonstrate stronger team processes, and perform more favorably, than teams who were not. The format and procedure for the training
Manipulation was adapted from Ellis and colleagues (2005), who demonstrated the utility of such training in the laboratory.

Figure 1. Team processes (boxes) trained.

Participants had different levels of medical expertise, but the simulations required only knowledge of common procedures with which all participants should have been familiar. Each scenario involved participants interacting with the nurse confederate and mannequin to gather information regarding patient status, identify symptoms, develop a diagnosis, and follow national standardized treatment guidelines. The “patient” was a programmable human physiology-based METI HPS® medical mannequin with intact respiratory, circulatory, and pharmacologic properties. The mannequin uploaded real-time data for monitoring health indicators like blood pressure and heart rate, and accepted and responded to medicine and fluids administered.

Participants were recorded (video with audio) while working together in these scenarios. Emergency physicians coded videos for team performance indicators; trained coders rated team behaviors taking place throughout each scenario. Metrics used for coding were previously content validated by subject matter experts in emergency medicine and team processes.
Additional data were collected via surveys before, between, and after engaging in scenarios. These surveys gathered information on a variety of factors, including team composition (demographics, personality), team cognitive and motivational processes (team mental models, team efficacy), and perceived team effectiveness. Taken together, the team process, performance, and characteristic data can offer a more complete picture of emergency medical teams than is currently represented in the literature.

Our paradigm is unique in that it allows us to learn how team processes and performance influence one another within and across different realistic medical emergency scenarios. Also, by supplementing self-report measures with objective coding of team functioning, we should be able to confidently make claims about the usefulness of our research.

Data coding and analyses are currently underway for this project. In our presentation, we will further discuss our approach, our results, and potential implications for team training and healthcare. This is a timely and critical report, as current healthcare team training programs (e.g., TeamSTEPPS) require significant resources and their impact on emergency team efficacy and patient care is unknown. Our research can serve as a roadmap for other scholars, and our results will provide further insight into the impact of team training on emergency medical teams.


A Configural Approach to Patient Safety Climate: The Relationship between Climate Profile Characteristics and Patient Outcomes

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&

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Patient safety climate is defined as a holistic snapshot of enacted work environment practices and procedures related to patient safety, derived from shared perceptions of social and environmental work characteristics. While patient safety climate has been touted as a critical factor underlying safe patient care, our understanding of input factors influencing shared climate perceptions and, in turn, the effects of climate as a collective, group-level construct on important outcomes remains underdeveloped, both theoretically and empirically. Therefore, the current study examines (1) the antecedents that impact individual patient safety climate perceptions and (2) the relationships between hospital unit patient safety climate and two important unit level outcomes: patient willingness to recommend a facility to others and patient safety. This study also examines climate strength—the degree to which climate perceptions are shared—as a moderator of these relationships.

While climate is conceptualized as a holistic description of the working environment, existing evidence has focused on relationships between the independent dimensions of patient safety climate and patient safety. No study to date has examined the configurations (i.e. patterns or profiles) among the multiple dimensions of patient safety climate or how these configurations are related to important employee and patient outcomes. Evidence from studies of general organizational climate suggests that the shape of the pattern among climate dimensions, the overall mean score across dimensions, and the degree to which dimension scores vary are predictive of employee attitudes, customer satisfaction, and
organizational financial performance (Dickson et al., 2006; Joyce & Slocum, 1984; Jackofsky & Slocum, 1988; Gonzalez-Roma, Peiro, & Zornoza, 1999; Litwin & Stringer, 1968; Schulte et al., 2009). The current study tests a theoretical model of patient safety climate examining the configural nature of the construct.

Method

Participants

An archival dataset collected from seven hospitals located in a metropolitan area of the southeastern United States was utilized to test study hypotheses. Data was collected from 3,149 individuals nested within 84 hospital units.

Measures

Patient safety climate was measured using the Hospital Survey on Patient Safety Culture (Sorra & Nieva, 2004). Unit level patient safety and patient willingness to recommend was collected by the hospital risk management and nursing administration departments.

Analytical Strategy

Hierarchical linear modeling (HLM7; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) was utilized to test hypotheses regarding antecedents of individual level perceptions of patient safety climate to account for the fact that individuals were nested within hospital units. Descriptive statistics and bivariate correlations among individual-level variables appear in Table 1.

Traditional multiple regression analyses were utilized to test unit-level hypotheses examining the relationships between unit level patient safety climate and patient outcomes. Prior to testing unit level hypotheses individual climate scores were aggregated to the unit level. ICC(1) values based on unit membership across the seven climate scales ranged from 0.15 to 0.52 (M = 0.40), the ICC(2) values ranged from 0.42 to 0.81 (M = 0.66), and the average $r_{wg(j)}$ ranged from 0.56 to 0.76 (M = 0.68). Additionally, significant differences between units were suggested by univariate analyses of variance (ANOVA) analyses run for each of the seven climate dimensions. Thus, there was reasonable within-unit
agreement and between-unit variability to operationalize climate as an emergent construct at the unit level of analysis. Descriptive statistics and bivariate correlations among unit level variables appear in Table. 

Summary of Results & Discussion

Results indicated that unit membership was significantly related to individual climate perceptions—specifically, individual-level climate profile elevation. In turn, individual climate profile elevation and profile variability were related to employee willingness to recommend their organization to family and friends in need of care. At the unit level of analysis, climate profile variability was significantly related to patient willingness to recommend the organization others, and climate shape was found to be related to patient safety. Furthermore, these results were not dependent on climate strength.

The current study meaningfully contributes to the conceptual understanding of the patient safety climate construct by examining the degree to which configural aspects of the construct are predictive of important outcomes across multiple levels of analysis. In this way, it extends beyond existing studies of climate configurations to examine relationships at multiple levels of analysis and to also examine the moderating effects of climate strength. Practically, results provide insight into how the construct of patient safety climate can be used diagnostically and prescriptively to improve patient care and the working environment for providers. In addition to contributing to the theoretical understanding of the patient safety climate construct, this study also augments the evidence-base available to administrators, front-line providers, and regulators regarding how patient safety climate can be used to guide and align quality improvement efforts for greatest impact.
Table 1. Descriptive statistics and zero order correlations among study variables of interest at the individual level of analysis (n = 3,149).

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*p<.05 (2-tailed), **p<.01 (2-tailed)

a Dummy coded such that 1 = Unit is member of group
Table 2. Descriptive statistics and correlations for the unit level of analysis.

| Unit Climate Profile Characteristics                                      | Mean | SD  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  |
|----------------------------------------------------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. Profile Elevation                                                      | 3.77 | 0.25| -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| 2. Profile Variability                                                    | 0.37 | 0.09| -23*| -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| 3. Profile Shape 1: Punitive                                               | 0.44 | 0.50| -31**| 10  | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| 4. Profile Shape 2: Learning                                               | 0.13 | 0.34| -68**| 0.04| -34**| -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| 5. Profile Shape 3: Supportive                                             | 0.43 | 0.50| 78**| -12| -77**| -34**| -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| Patient Outcomes                                                          |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6. Willingness to Recommend                                               | 3.43 | 0.28| 15  | -45**| -23 | 11  | .17 | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| 7. Patient Safety                                                         | 0.00 | 1.00| -18 | 0.06| 0.09| 0.08| -15| -30 | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| Control: Unit Type                                                        |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 8. Emergency                                                              | 0.11 | 0.31| -16 | -0.3| 0.00| 0.21| -14| 0.02| .67**| -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| 9. Proceduralized                                                         | 0.25 | 0.44| 11  | -20 | .10 | -06 | -06| 0.19| -25*| -0.2| -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| 10. Non_Proceduralized                                                    | 0.64 | 0.48| 0.01| 0.20| -09| -08 | 0.14| -19| -78**| -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| Climate Dimensions                                                        |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 11. Team Within Unit                                                       | 4.07 | 0.31| .72**| .06 | -21| .58**| .61**| .04 | .22 | -18 | -03| .14 | -   | -   | -   | -   | -   | -   | -   |
| 12. Supervisor Expectations                                               | 4.00 | 0.35| .88**| -.01| -.17| -.69**| .64**| -.19| -.08| -.16| 0.06| .05| .56**| -   | -   | -   | -   | -   | -   |
| 13. Continuous Learning                                                    | 3.95 | 0.25| .82**| -.15| -.24| -.53**| .60**| .28 | .04 | -.01| .02 | -.02| .47**| .66**| -   | -   | -   | -   | -   |
| 14. Perceptions of Safety                                                 | 3.52 | 0.32| .84**| -.31**| -.28**| -.48**| .61**| .45**| -.42**| -.24**| .26**| -.07| .58**| .60**| .71**| -   | -   | -   | -   |
| 15. Feedback and Communication about Error                                | 3.94 | 0.28| .79**| -.07| -.33**| -.46**| .65**| .23 | -.00| -.05| .05 | -.02| .34**| .71**| .74**| .59**| -   | -   | -   |
| Communication Openness                                                    |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 16. Communication Openness to Error                                       | 3.75 | 0.27| .89**| -.15| -.28**| -.62**| .70**| -.01| -.22| -.16| .15 | -.03| .60**| .84**| .64**| .72**| .65**| -   | -   | -   |
| 17. Non-Punitive Response to Error                                        | 3.15 | 0.33| .81**| -.66**| -.30**| -.51**| .65**| .15 | -.08| -.09| .10 | -.03| .53**| .65**| .58**| .61**| .57**| .68**| -   | -   |

*p<.05(2-tailed), **p<.01 (2-tailed)

a Dummy coded such that 1 = Unit is member of group
Figure 1. Example of patient safety culture profile characteristics (adapted from Schulte et al., 2009).
References


Retaining primary care providers (PCPs) is critical to ensure health care access and quality, especially in the era of the Affordable Care Act of 2010. Low salaries in comparison to that of other specialties has threatened PCPs for some time; however, new challenges related to recent bold initiatives such as implementation and use of electronic health records (EHR) have emerged. EHRs have been lauded as facilitating workflow and improving efficiencies in the clinic; for example alert notification systems (ANS), an important EHR feature used to notify PCPs real time of important findings, can facilitate prompt review and action on test results. However, studies have shown that, depending on how they are implemented, ANS can instead hamper workflow, which can be a source of dissatisfaction and stress for PCPs (Poon, Ghandi, Sequist, Murff, Karson, & Bates, 2004). Utilizing and extending conservation of resources theory (Hobfoll, 1989) we tested a model examining the impact of support systems such as supportive norms, feedback, and training, and providers’ perceptions of the benefits of ANS on job satisfaction, intentions to leave, and voluntary turnover.
Methods

Design and Setting

We conducted a cross-sectional web-based survey of PCPs at practicing Department of Veterans Affairs (VA) medical facilities. The VA is the largest integrated health care system in the US, and the most advanced in terms of EHR use, with EHRs in place at all medical facilities for almost a decade.

Participants and Procedure

Using a nationwide VA administrative database (VA Primary Care Management Module), we identified and invited all VA PCPs with a minimum practice panel size of 250 patients (N=5001). Of 5001 PCPs invited, 2590 (51.8%) responded. Respondents were 55.4% female, 31.1% non-white, and 31.5% non-physician providers (e.g., physician assistants, nurse practitioners); 82.1% had 2 or more years in VA practice, and 49.0% had prior experience using a non-VA EHR.

Participants were recruited as follows: We first asked chiefs of primary care at each facility to email information about the project and the upcoming survey to the PCPs at their respective sites. We subsequently invited all participants via a personalized email from the study’s principal investigator describing the study and providing a link to the web-based survey. To increase response rates, invitation emails and subsequent reminders were followed by telephone attempts to reach non-respondents.

Measures

The appendix lists all survey items used for this study.
Turnover. Facility-level voluntary turnover rates for 2009 and 2010 were obtained from the VHA Service Support Center (Human Resources Cube), a large administrative database repository.

ANS Support Systems. Measures for the constructs of interest (supportive norms, defined herein as observations of others’ successful ANS use and encouragement from them to use ANS; training; monitoring and feedback) were developed based on a literature review and refined through pilot-testing with PCPs. Reliabilities for the two scale based constructs, supportive norms and monitoring/feedback, were .71 and .83, respectively.

Provider Perceptions. Perceived performance expectancy was developed as described above (α = .85). Employee satisfaction, and turnover intentions) were measured via a single survey item, as suggested by Cortese and Quaglino (2006).

Data Analysis

Facility-level Aggregation. Because employee turnover, our main outcome variable, was only available at the facility level, traditional regression models were not appropriate; it was necessary to aggregate all predictors to the facility level (n=142). Within-facility analyses of interrater agreement for each variable showed sufficient agreement to justify aggregation (average $r_{wg} = .71$).

Model Test. We used structural equation modeling to test our hypothesized path model. Figure 1 presents the model tested. We additionally computed simple bivariate correlations to further explore the data.

Results

Bivariate correlations indicated significant relationships between facility level turnover and job satisfaction and intention to quit, respectively (see Table 1). Additionally, training and
providers perceptions of benefits of ANS correlated with job satisfaction and turnover intentions, whereas supportive norms and monitoring/feedback correlated only with turnover intentions. Model fit of these relationships when tested as a model, however, was poor (RMSEA = .21), contrary to our hypotheses.

Discussion

Having appropriate workplace support systems for successfully using ANS is an important contributor to job satisfaction and turnover intentions among PCPs. This is consistent with prior research suggesting that provider retention is in part a function of having the needed and customary resources to do their work. However, there are many possible contributors to voluntary turnover outside of workplace support systems or job satisfaction, thus a causal link from resources to turnover through satisfaction and turnover intentions cannot as of yet be established.
References


Appendix: Survey items used in the current study

**Supportive Norms**
1. My supervisor believes alert notifications in CPRS are an essential component of effective primary care.
2. Senior management of this hospital has emphasized the importance of the use of alert notifications in high quality care.

**Monitoring and Feedback**
3. Someone from the Chief of Primary Care's office monitors how I manage my alert notifications.
4. I receive feedback from my facility leadership on my performance regarding follow-up of alert notification.

**Training**
5. I have received appropriate levels of training in using the CPRS alert notification system.
6. Since my initial orientation, I have received refresher training pertaining to the alert notification system in CPRS.

**Perceived Performance Expectancy**
7. Using alert notifications in CPRS enhances my ability to provide safe patient care.
8. Using alert notifications in CPRS enhances my effectiveness on the job.
9. Using alert notifications in CPRS increases my productivity.
10. Using alert notifications in CPRS allows me to meet performance standards.

**Employee Satisfaction**
11. Overall, I am satisfied with my job.

**Turnover Intentions**
12. The frustration I experience with the View Alert system has led me to consider quitting work at the VA.
Table 1. Correlations among hypothesized variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>1. Feedback</td>
<td></td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Training</td>
<td>.418**</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3. Supportive Norms</td>
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<td>.229**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4. Perceived provider expectancy</td>
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<td>.100</td>
<td>.840**</td>
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<td></td>
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<td></td>
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<tr>
<td>5. Intention to leave</td>
<td>.185*</td>
<td>.106</td>
<td>-.170*</td>
<td>-.383**</td>
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<td></td>
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<td>6. Job satisfaction</td>
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<td>-.045</td>
<td>.286**</td>
<td>.495**</td>
<td>-.653**</td>
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<td></td>
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<tr>
<td>7. Voluntary turnover</td>
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<td>-.029</td>
<td>-.024</td>
<td>-.103</td>
<td>-.169*</td>
<td>-.167*</td>
<td>1</td>
</tr>
</tbody>
</table>

* p < .05
** p < .01
Figure 1. Hypothesized relationships among ANS support systems (monitoring/feedback, supportive norms, training) and provider perceptions of the ANS on job satisfaction, turnover intentions, and voluntary turnover.
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