

**Linking Health Care Workarounds and Burnout to Patient and Worker Safety:  
Final Progress Report**

Jonathon R. B. Halbesleben, Ph.D.  
HealthSouth Chair of Health Care Management & Associate Professor  
Department of Management & Marketing  
Culverhouse College of Commerce and Business Administration  
University of Alabama  
Box 870225  
Tuscaloosa, AL 35487-0225  
(205) 348-2702  
jhalbesleben@cba.ua.edu

Project Awarded to:  
University of Alabama  
Box 870104  
Tuscaloosa, AL 35487-0104

Grant Number: 7K01OH008965-04  
9/1/2008-8/31/2011

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## **Linking Health Care Workarounds and Burnout to Patient and Worker Safety**

### **List of Terms and Abbreviations**

APA: American Psychological Association

CD: Coefficient of Determination

CDC: Centers for Disease Control and Prevention

CFI: Comparative Fit Index (statistic indicating fit of a structural equation model)

COR: Conservation of Resources theory

df: degrees of freedom

OLBI: Oldenburg Burnout Inventory

RMSEA: Root Mean Square Error of Approximation (statistic indicating fit of a structural equation model)

T1, T2, T3: Time 1, Time 2, Time 3

TLI: Tucker-Lewis Index (statistic indicating fit of a structural equation model)

## **Linking Health Care Workarounds and Burnout to Patient and Worker Safety**

### **Abstract**

Principal Investigator: Jonathon R. B. Halbesleben, Ph.D.  
HealthSouth Chair of Health Care Management & Associate Professor  
Department of Management & Marketing  
Culverhouse College of Commerce and Business Administration  
University of Alabama  
Box 870225  
Tuscaloosa, AL 35487-0225  
(205) 348-2702  
jhalbesleben@cba.ua.edu

The objective of this grant was to understand how nurse burnout is associated with occupational injuries (e.g., needlesticks) by increasing the likelihood that a nurse will bypass safety procedures (called safety workarounds). While much has been written about the increase in stress and burnout among nurses, there has been little to no research linking this problem with the parallel finding of increasing occupational injuries in nursing.

As a K01 award, a portion of the grant was focused on career development activities of the PI, consistent with the objectives of the career development grant program. These activities included mentored training and coursework in occupational safety and health and health care work processes. Additionally, the PI has engaged in extensive observations in health care settings to better understand nursing work processes related to safety.

In addition to the career development activities, the PI has collected data from 575 nurses in five hospitals over three data collection periods. The data include participants' burnout, use of safety workarounds, and occupational injuries. These data support the predicted model where nurse burnout is associated with a higher use of workarounds, which is subsequently associated with a greater incidence of occupational injuries. These findings suggest that steps taken to reduce burnout among nurses could reduce occupational injuries through a greater adherence to safety procedures.

## Section 1

### **Significant Findings**

This project found that burnout of nurses leads to a higher likelihood that they will engage in behaviors that bypass safety procedures (safety workarounds); workarounds appear to be subsequently associated with occupational injuries. This was true over an 18-month period.

### **Translation of Findings**

The findings from this study have the potential to inform health care administrators of the causal links between nursing stress and injury. This will support efforts to reduce occupational injuries, as it gives health care administrators specific targets (e.g., burnout reduction programs).

### **Outcomes/Impact**

Over the past two decades, health care workers have undergone seemingly constant work redesign with the stated goal of improving health outcomes for patients and making work better for health care professionals. However, there have been very few attempts to understand how strategic decisions to change the manner in which work is performed by health care workers influence the attitudes and behaviors of health care workers. Similarly, the focus of many health care specific occupational injuries (e.g., needlesticks) has been on minimizing exposure, developing a culture of safety, and reporting. While these are certainly important factors, there has been relatively little attention given to how the excessive demands placed on health care workers have led employees to bypass safety precautions that might prevent injury. There also has been little attention given to how work redesign changes, many of which are designed to improve the work flow so as to reduce injuries, might increase injuries because of the additional demands required to learn new procedures (which lead to workarounds of the intended work process). This project addresses that significant gap in the literature.

## Section 2: Scientific Report

### Background for Project

NIOSH has a long history of supporting job stress research (Murphy, 2002), including some of the classic works in the area over the past 30 years (e.g., Caplan, Cobb, French, Van Harrison, & Pinneau, 1975). Recently, NIOSH has worked to develop research in occupational health psychology (Sauter, Hurrell, Fox, Tetrick, & Barling, 1999) and through the National Occupational Research Agenda (NORA), have focused attention on the outcomes of stressful working conditions and health services research. This proposal is an attempt to extend this work by bringing together research on occupational health psychology (burnout), a potential but occupationally-relevant cause of burnout (workarounds), and occupational health outcomes in health care professionals (exposure to infectious disease, low back disorders, musculoskeletal disorders, and traumatic injuries) and their patients. Specifically, I seek to understand how workarounds lead to changes in employee attitudes and motivation (via burnout) and subsequently to outcomes for employees (occupational injuries and illnesses) and patients (medical errors). In this section, I discuss the nature of those relationships, including the theoretical background supporting these predictions.

This project is driven by three specific aims:

*Specific Aim 1:* To link workarounds in health care to occupational health consequences such as burnout and occupational illness and injuries.

*Specific Aim 2:* To link workarounds and burnout to medical errors, specifically linking health care workforce burnout to incidence and reporting of medical errors, and compliance with safety procedures

*Specific Aim 3:* To link workarounds and health care workforce burnout to incidence of occupational injuries and illnesses of health care workers.

### *The Conservation of Resources Model*

The dominant theory to explain the process of burnout has been Hobfoll's (1988; 1989; 1998) Conservation of Resources (COR) model. The COR model is based on psychological processes associated with resources, defined as those psychological commodities that we value (e.g., meaningful employment, time with family, satisfaction with life and work, etc.). The model further proposes that stress results from one of three processes, 1) loss of resources, 2) threat to current resources, and 3) inadequate return on investments made to maximize resources (e.g., an employee who engages in extra training in order to increase the likelihood of a pay raise, but does not receive the raise). Burnout is the result of repeated investment in work resources without adequate return in that investment (Hobfoll & Freedy, 1993).

The COR model is useful for understanding the relationships between workarounds and burnout. The limited resources available to those experiencing high exhaustion will mean they will be even more likely to be careful in their investment of remaining resources (Hobfoll, 2001). Safe behaviors may be seen as discretionary behavior that will require additional resources, particularly in contexts where safe behavior is not rewarded and the investment of motivational resources in safety behavior will not lead to a resource gain. From COR theory, when faced with the decision to follow proper safety protocols designed to protect the employee or workaround those protocols in order to get the work done (typically at higher risk but with less effort invested), employees higher in exhaustion will be more likely to engage in workaround behavior.

*Thus, in addressing Specific Aim 1, I predict that nurse workarounds will be associated with higher levels of burnout.*

#### *Consequences of Workarounds and Burnout*

The COR model is valuable in that it further specifies the processes that occur once an employee has become burned out. It suggests that once an employee has reached the point of burnout, he or she becomes more careful in how he or she invests future resources in work (Hobfoll, 2001; Hobfoll & Shirom, 2000; Siegall & McDonald, 2004). This means, for example, that when an employee experiences the emotional exhaustion symptom of burnout, he or she may be more likely to pull away from those associated from the job, including patients (Leiter, 1993). Moreover, employees may demonstrate new resource investment strategies by directing their motivational resources in very specific aspects of the job (Baltes, 1997; Baltes & Baltes, 1990), for example focusing only on the parts of the job that they like or believe they are good at. Researchers have demonstrated such an effect with regard to job performance, finding that employees who are experiencing symptoms of burnout tend to focus their motivation at work toward very specific aspects of the job (Halbesleben & Bowler, 2007; Wright & Cropanzano, 1998).

*Burnout and Patient Outcomes.* A number of previous studies have examined links between burnout and patient outcomes, with the primary focus on patient satisfaction. For example, Leiter, Harvie, and Frizzell (1998) examined the relationship between unit-level nurse burnout and patient satisfaction. Across 16 hospital units, they found a significant relationship between emotional exhaustion, depersonalization, and patient satisfaction. In other words, when patients stayed in a unit where nurses, as a unit average, reported higher emotional exhaustion or depersonalization, the patients tended to be less satisfied with their stay. Vahey, Aiken, Sloane, Clark, and Vargas (2004) echoed this finding, calling for changes in workforce factors such as staffing, administrative staffing, and relationship development between nurses and physicians that might help to reduce burnout and improve patient satisfaction (see also Garman, Corrigan, & Morris, 2002).

While an important starting point for linking burnout with patient outcomes, the literature in this area has been limited. Specifically, there has been no attempt to link burnout to patient outcomes other than satisfaction. While health care organizations recognize the importance of patient satisfaction, they may also be interested in other patient outcomes. The present study expands our understanding of the relationship between health care provider burnout and patient outcomes by also considering the relationship between burnout and length of hospitalization and recovery time.

*Specific Aim 2: Relationship with Medical Errors.* When we apply the conservation of resources model to the relationship between health care providers and patients, it suggests that when providers reach the point of burnout, they will become careful in the future investment of their resources. Given the noted negative reciprocity associated with the relationship with patients and resulting negative attitudes toward patients (Bakker, Schaufeli, Sixma, Bosveld, and van Dierendonck, 2000), providers may be hesitant to continue to invest extra motivational resources (beyond those required for basic care of patients) in patient relationships. This conservation of motivational resources may lead to lower health care quality because of a higher risk of medical errors.

Burnout has been shown to be negatively related to certain employee emotional states, particularly positive affect (Thoresen, Kaplan, Barsky, Warren, & de Chermont, 2003). That is, employees who are burned out are less likely to feel positive on the job. Positive affect has been empirically linked to enhanced decision making (Fredrickson, 2001), as well as problem solving, and higher levels of patient-centeredness in health care providers (Isen, 2001). It is likely that

burned out employees are less cognitively vigilant and less likely to put forth extra effort necessary for the highest quality care delivery. Thus, we propose that health care providers who are lower in burnout will be involved in fewer preventable adverse medical events, which will likely result in shorter hospital stays and faster recovery times for patients. *Thus, in addressing Specific Aim 2, I hypothesize that higher nurse burnout will be associated increased perceptions of an unsafe patient safety environment and increased medical errors*

*Specific Aim 3: Relationship with Occupational Injuries.* The number of occupational injuries and illnesses suffered by health care workers has been staggering and has been growing (Lipscomb & Borwegan, 2000). At this point, the rate of occupational injuries and illnesses in health care exceeds that of all private industries; this is particularly alarming given the high number of injuries, for example needlesticks, that are underreported in health care (Cardo, Culver, Srivastava, & Campbell, 1997). Waehrer, Leigh, and Miller (2005) recently conducted a cost analysis of occupational injuries and illness in health services, finding costs exceeding \$3 billion annually for nurses alone, with the majority of those costs associated with injuries occurring at hospitals. In nursing, the high rate of occupational health concerns has been linked to concerns over workforce and staffing shortages. For example, a 1996 report from the Institute of Medicine found an association between nursing staffing levels and back injuries among nurses.

While considered an occupational health concern itself (cf., Baker & Karasek, 2000), job stressors have been associated with other occupational injuries and illnesses in a number of occupations, including musculoskeletal strain in office workers (Lindstrom, Leino, Seitsamo, & Torstilla, 1997) and agricultural workers (Hagen, Magnus, & Vetlesen, 1998) and cardiovascular disease in a wide array of occupations, particularly “blue collar” jobs (Theorell & Karasek, 1996). A literature review of the relationship between stress and occupational injury (Johnston, 1995) found a relatively strong pattern of relationship between stress and injury (e.g., twelve of the twenty studies cited had odds ratios between stress and injury of over 1.0); however the author noted limitations in the generalizability of the findings because of, among other factors, a limited number of occupations represented.

Over time, the accumulation of job stressors can lead to burnout (Baker & Karasek, 2000; Halbesleben & Buckley, 2004). As such, one would expect that the impact that burnout has on occupational injuries and illnesses would be similar, if not stronger, than the relationships between stress and occupational health concerns. However, as lamented by Maslach (2001; see also Leiter & Maslach, 2000), there has been little attempt to link burnout with physical health and with occupational health specifically.

A similar line of thinking as outlined for patient outcomes applies to the relationship between health care worker burnout and occupational health concerns. As employees experience higher levels of burnout, they may be less likely to carefully invest motivational resources in safety procedures (e.g., taking extra care with sharp objects that have been contaminated with a patient’s blood; Hobfoll & Freedy, 1993). As such, they may put themselves at risk for occupational injuries. *Thus, in addressing Specific Aim 3, I predict that higher nurse burnout will be associated with higher incidence of occupational injuries and illnesses via a higher use of safety workarounds.*

### **Career Development Activities**

Due to the nature of this grant as a Career Development Award, the activities of the grant are divided into two components: Career Development and the Research Study. Over the course of the funding period, I completed the following Career Development Activities:

1. Health care process mentoring through the University of Missouri Center for Health Care Quality

This has been initiated with Dr. Douglas Wakefield, director of CHCQ. Through Dr. Wakefield, I have completed a course in health care systems (HMI 7410) and have been given additional readings and structured tutorials on health care systems and health care work process design. I met with Dr. Wakefield in Columbia, Missouri in January of 2009 for some of this work and will meet with him in person again in early summer of 2009. As had been proposed in the grant, I have been involved in other CHCQ-sponsored projects; these have led to additional opportunities for data collection and publication not directly related to this grant (including an article appearing in Medical Care Research and Review early in 2009 on the use of super-users to support clinical information system implementation). Throughout the grant period, Dr. Wakefield and I have maintained regular contact and he regularly sends me readings of interest in the area of health care quality.

2. Mentoring on Occupational Health of Health Care Workers

This has been initiated with Dr. Susan Gerberich of the Midwest Center for Occupational Health at the University of Minnesota. It has involved weekly participation in a doctoral-level seminar in occupational injuries (PubH 8120). Dr. Gerberich has provided additional readings on occupational injuries, with a particular emphasis on injury epidemiological methods, that I have completed. Since the doctoral-level seminar has concluded, I have continued to independently pursue additional readings on health care occupational injuries and epidemiological methods.

3. Coursework/Seminars on Occupational Injuries/Injury Epidemiology

As noted above, from September 2009-December 2009, I participated in a doctoral-level seminar (PubH 8120) at the University of Minnesota. As part of the seminar, I presented an overview of my project, including the proposed research study and was provided feedback by faculty and graduate students on study design. Later in the semester, I was given additional feedback on my survey measures.

4. Observation in MU Health Care System/Local Health Care Providers

This was started over the summer of 2008 and has continued, with observations at four hospital facilities (one in Missouri and three in northern Wisconsin). These observations have helped to shape my understanding of work process in health care (and nursing in particular) and led to make adjustments to research study design.

5. Mentoring on VA Hospital System/Nursing Work Process

During my January 2009 trip to Columbia, Missouri, I met with Dr. Bonnie Wakefield about the VA hospital system and nursing work process. We have continued telephone and e-mail meetings over the past few months. Her mentorship and networking have assisted in the research components of the grant, particularly recruitment of hospitals to participate in the survey.

6. Creation of Health Care Work (Research) Group

During my January 2009 trip to Columbia, Missouri, I started the organization of a proposed health care research group in order to develop further research collaborations. I met with potential members of the research group. I have been continuing work on implementation and adoption of information technology (which ties in with my work in workarounds) with Dr. Douglas Wakefield. I have also been working on a new paper examining burnout, satisfaction with medication administration systems and workarounds of those systems with Dr. Cheryl Rathert of the University of Missouri. This has continued to be a strong source of collaboration and will continue to grow.

## 7. Additional Development Activities

In addition to those outlined above, I have engaged in additional research development activities not originally proposed in the grant. In September 2008, I presented my grant proposal to the Department of Industrial Engineering at the University of Wisconsin-Madison for their feedback on measurement of work process (the faculty of that department include experts in health care work process and safety). In March of 2009, I attended and presented at a statewide health care research forum at the University of Wisconsin-Stevens Point to gain additional feedback and network with potential collaborators. In May 2009, I attended a symposium hosted by the Midwest Center for Occupational Health at the University of Minnesota where I presented a poster with initial findings from my grant and attended a presentation by NIOSH acting director Christine Branche. In June, 2010, I visited the NIOSH offices in Cincinnati to discuss my research with NIOSH personnel and develop future collaborative opportunities. In May of 2011, I attended the APA/NIOSH Work, Stress and Health Conference in Orlando to learn more about the current research that might impact my own work.

## Procedures/Methodology

In addition to the career development activities, I completed a study designed to test a model linking nurse burnout with safety workarounds and occupational injuries. The participants in the project were 575 nurses in five acute-care hospital facilities. The study used a repeated measures design, whereby the measures are collected at six-month intervals.

*Exhaustion.* Exhaustion was assessed using the exhaustion subscale of the Oldenburg Burnout Inventory (OLBI; Demerouti, Bakker, Vardakou, & Kantas, 2003). It is an eight-item measure; for each item the participant indicates the extent to which he or she agrees with statements symptomatic of exhaustion. A sample item is “There are days that I feel already tired before I go to work.” Items were scored on a five-point Likert-type scale from strongly disagree (1) to strongly agree (5); higher scores indicate higher exhaustion.

*Safety workarounds.* Safety workarounds were assessed using a three-item scale that asked participants the frequency with which they bypassed required organizational safety procedures/rules (Halbesleben, 2010). A sample item included “I bypass safety rules in order to get work done.” Items were scored on a seven-point frequency scale from never (1) to every day (7); higher scores indicate a higher frequency of engaging in workarounds.

*AHRQ Safety Culture Survey.* This measure will be used to assess safety outcomes including frequency of event reporting (3 items), number of events reported (1 item), and patient-safety grade (as perceived by the nursing staff; 1 item). According to extensive testing by AHRQ, the survey generally takes 10-15 minutes to complete. In order to increase accuracy, particularly in the outcome measures, the items will be completed anonymously.

*Medication Administration Error Reporting Survey.* This measure, developed by Wakefield, Uden-Holman, & Wakefield (2005) focuses on medication errors, including assessing why they occur, how often they are reported, and why they are not reported. This measure is included because, based on the pilot data, many of the workarounds appear to focus on the medication administration process; moreover, medication administration is a very common process and the source of a large percentage of errors in hospital settings (Institute of Medicine, 2007). Inclusion of this outcome would assess links between burnout and medical errors (Specific Aim 2).

*Occupational injuries.* Occupational injuries were reported with a self-report checklist of injuries that have occurred in the past six months. Six months was used as a timeframe for both practical reasons (we were given permission to conduct the survey in six-month intervals) and because we felt it would increase the likelihood that the participants would remember the number and severity of their injuries (as opposed to the common one-year timeframes used in injury research; Moshiro, Heuch, Astrøm, Setel, & Kvåle, 2005). This checklist was based on the Bureau of Labor Statistics system and an existing survey from the CDC (2004), with some modifications to address the specific injuries faced by health professionals in a hospital setting. Sample items included “needlesticks” and “lower back pain.” Participants indicated how often they sustained an injury within the last six months in incidents (e.g., number of needlesticks) or days where the injury was experienced (e.g., days with lower back pain). These were summed to create a score for the frequency of occupational injuries. Additionally, the participants indicated how many days of work were missed due to the injury. These were intended to provide some indication of the severity of the occupational injuries. As noted, this measure was collected at all three data collection periods; the measure asked about injuries that had occurred in the six months prior to the survey. Therefore, the Time 1 survey included injuries prior to the exhaustion and workaround measures, the Time 2 survey included injuries from the Time 1 survey until Time 2, and so forth.

Finally, I collected data for demographic variables (e.g., tenure, age), safety culture, and safety consciousness to include as controls in the analysis. I found that those variables had no bearing on the results and therefore continued the analyses without controlling for them.

## **Results/Discussion**

### *Occupational Injury Outcomes*

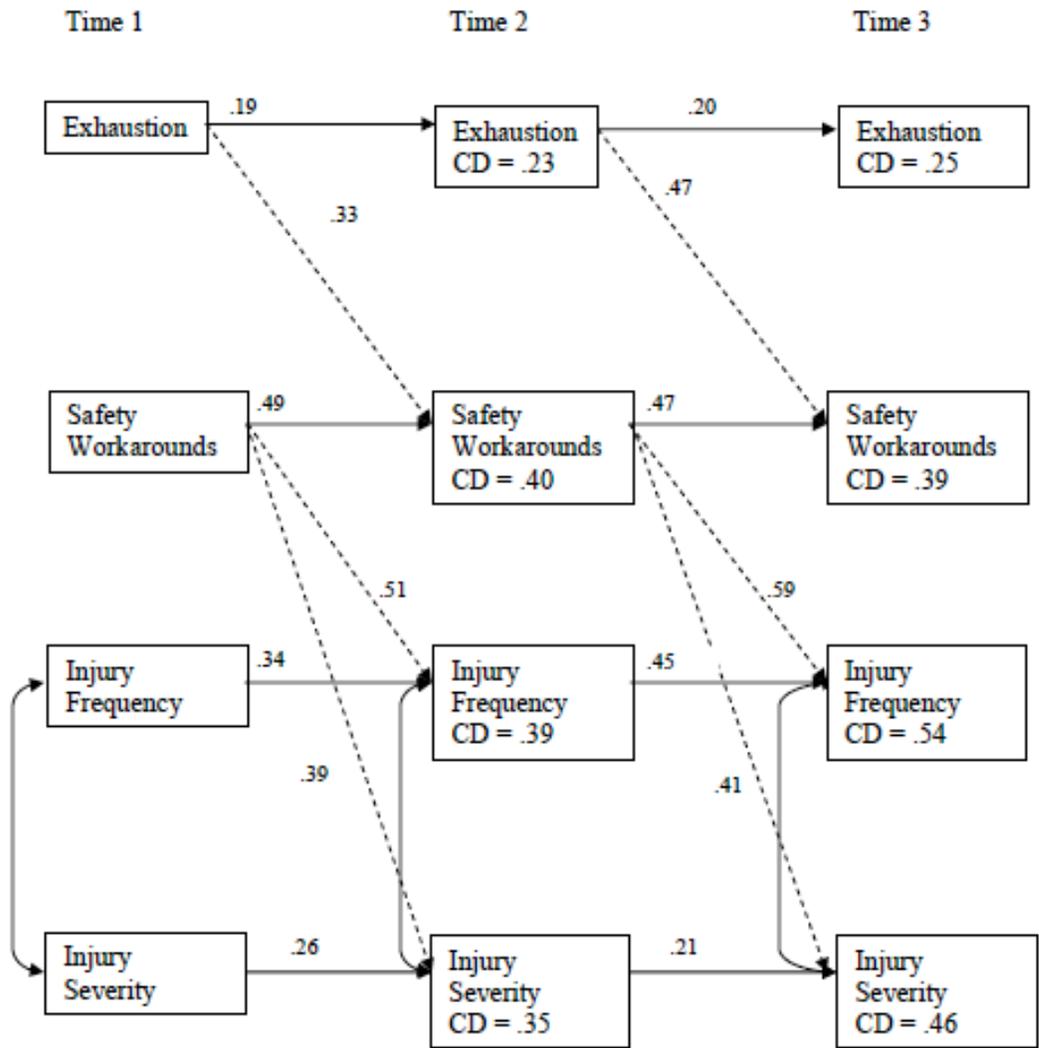
The data were analyzed using structural equation modeling, following techniques that had been previously implemented in the literature for testing mediated models with data collected from cross-lagged panel designs (Maxwell, 2003; Taris & Kompier, 2006). These techniques involve testing a series of nested structural models that build from a baseline model where the effects of a variable at Time 1 (e.g., Time 1 exhaustion) predict that same variable at Time 2 to a model that can effectively test the mediated effect of exhaustion on occupational injuries through workarounds.

To start, I tested a model that included simply the direct effects of the predictor (T1 exhaustion) to the outcome (T3 injuries), without the mediator. This model provided adequate fit for both samples ( $\chi^2 = 4.87$ ,  $df = 2$ ,  $TLI = .94$ ,  $CFI = .95$ ,  $RMSEA = .05$ ). However, the coefficient of determination for occupational injuries in these models was low (.05 for frequency, .04 for severity), which suggests that there may be more direct factors that can improve in the prediction of injuries beyond exhaustion. Next, I tested the stability model that included the autoregressive

effects over time of each latent variable but did not include any cross-lagged associations (e.g., T1 exhaustion → T2 exhaustion → T3 exhaustion). The model fit the data adequately in both samples and with both types of injury outcomes ( $\chi^2 = 127.58$ ,  $df = 59$ ,  $TLI = .96$ ,  $CFI = .96$ ,  $RMSEA = .045$ ). While the models are not directly comparable, the coefficients of determination for occupational injuries are higher in this model than the direct effects model both for frequency and severity. The stability model will serve as a baseline for the subsequent model tests.

Next, I tested the causal model, which added the cross-lagged associations (e.g., T1 exhaustion to T2 workarounds; T1 workarounds to T2 injuries) to the stability model. These were added in a stepwise fashion, consistent with recommendations by Cole and Maxwell (2003); however, for brevity I report the final cross-lagged model fit with all cross-lagged paths added. This final model provided adequate fit to the data and fit the data better than the stability model ( $\chi^2 = 82.24$ ,  $df = 53$ ,  $TLI = .97$ ,  $CFI = .98$ ,  $RMSEA = .031$ ); moreover, the coefficients of determination for injury frequency and severity (were much higher with the addition of workarounds as a mediator. Importantly, the parameters for the cross-lagged effects are significant and in the predicted directions (see Figure 1). Taken together, these findings support the predictions that exhaustion is associated with workarounds, which are subsequently associated with occupational injuries. Next, I tested a loss cycle model that added a path from T1 injuries to T2 exhaustion and T2 injuries to T3 exhaustion. These models also adequately fit the data, but not significantly better than the causal model ( $\chi^2 = 72.65$ ,  $df = 49$ ,  $TLI = .97$ ,  $CFI = .98$ ,  $RMSEA = .029$ ). The coefficients of determination for occupational injuries again increased, though only modestly. In general, a loss cycle that one might expect based on conservation of resources theory was not present in these data.

Figure 1. Findings from cross-lagged panel design mediation tests of the relationship between exhaustion, workarounds, and injury outcomes.



Note: Solid lines indicate paths tested in the stability model, dashed lines were paths added in the causal (cross-lagged) model. Parameter estimates are derived from a test of the cross-lagged model. All parameter estimates are significant at the .05 level. CD = Coefficient of Determination.

Overall, These findings supported the mediation model that was proposed: exhaustion was associated with higher levels of occupational injuries, but that impact worked through workarounds. In other words, greater exhaustion led to greater workarounds, which led to more occupational injuries.

However, the data collected may lend themselves to even more sophisticated data analysis techniques that may allow for a more meaningful test of the mediated model. Specifically, the conservation of resources model is built on loss and gain cycles that accumulate over time. In an attempt to provide even more meaningful findings in the literature, I am in the process of re-analyzing the data using latent change score modeling (McArdle, 2009) since that form of modeling can directly examine the accumulation effects associated with gain and loss cycles. I anticipate this will be completed in early 2012 and a revised paper will be submitted for publication at that time.

I recognize that there are some limitations to this study. First, only nurses in acute care hospitals were included in the study. As such, it is unclear how much these findings may apply to other occupations or professionals working in other settings. Second, using retrospective recall techniques for injuries always introduces the possibility of recall bias. Third, while I examined the characteristics of the sample compared to the population of employees in the hospitals studied, topics such as exhaustion, workarounds, and injuries may have been considered sensitive and thus some nurses may have chosen not to participate as a result. Despite these limitations, this study offers an important first step in examining the link between the high levels of burnout in health care and a potentially serious outcome in the form of occupational injuries.

#### *Medical Error Outcomes*

As part of Specific Aim 2, I proposed that burnout would be associated with medical errors and patient safety culture based on the conservation of resources model. Unfortunately, the data did not support this contention. The relationships between burnout and patient safety culture were not significant (correlations of .06 for Time 1 and .09 for Time 2), nor were the relationships between burnout and medication errors (correlations of .02 for Time 1 and .04 for Time 2). Because of the very low correlations, I did not include these measures in the Time 3 survey in order to shorten the survey to make it more likely that respondents would complete the last survey.

#### **Conclusions**

This project found that nurses that experience emotional exhaustion are significantly more likely to engage in workarounds of safety procedures, which significantly increases their exposure to occupational injuries. This project reinforces previous studies that have suggested a need for intervention to reduce burnout of health care professionals. Given the increasing numbers and costs associated with occupational injuries in the health care industry, addressing burnout could lead to meaningful improvements in the well-being of nurses while also reducing costs to health care facilities.

#### **Publications**

Lawrence E, Halbesleben JRB, Paustian-Underdahl SC [under review]. Outcomes of Workplace Injuries: The Influence of Job and Financial Insecurity on Work-Family Conflict. *Journal of Applied Psychology*.

In this paper, we were able to leverage additional survey data from one of the study sites along with our occupational injury data to find that those participants that had experienced injuries were more likely to experience conflicts between work and family. This paper is not directly

related to the specific aims of the study; however, since part of the data associated with this grant was used in the paper, proper acknowledgement is included.

## References

- Baker DB, Karasek RA: [2000] Stress. Occupational health: Recognizing and preventing work-related disease and injury (4<sup>th</sup> ed, eds. BS Levy, DH Wegman). Lippincott, Williams, & Wilkins, pp 419-436
- Bakker AB, Schaufeli WB, Sixma HJ, Bosveld W, van Dierendonck D: [2000] Patient demands, lack of reciprocity, and burnout: A five-year longitudinal study among general practitioners. *Journal of Organizational Behavior* 21: 425-441.
- Baltes MM, Baltes PB [1990] Psychological perspectives on successful aging: The model of selective optimization with compensation. In *Successful aging: Perspectives from the behavioral sciences* (eds. PB Baltes, MM Baltes). Cambridge University Press, pp 1-34.
- Baltes PB [1997] On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of development theory. *American Psychologist* 52: 366-380.
- Caplan RD, Cobb S, French JRP, Van Harrison R, Pinneau SR [1975] *Job demands and worker health*. DHEW(NIOSH) Publication No. 75-160. Washington, DC: U.S. Government Printing Office.
- Cardo D, Culver D, Sristava, P, Campbell S [1997]. Results from the first phase of the national surveillance system for hospital health care workers. *American Journal of Infection Control* 25: 131.
- Centers for Disease Control and Prevention (CDC) [2004] *Sharps injury prevention workbook*.
- Cole D, Maxwell S [2003] Testing mediational models with longitudinal data: Questions and tips in the use of Structural Equation Modeling. *Journal of Abnormal Psychology* 112: 558-577.
- Fredrickson BL [2001]. Positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist* 56: 218-226.
- Garman AN, Corrigan PW, Morris S [2002] Staff burnout and patient satisfaction: Evidence of relationships at the care unit level. *Journal of Occupational Health Psychology* 7: 235-241.
- Hagen K, Magnus P, Vetlesen K [1998] Neck/shoulder and low-back disorders in the forestry industry: Relationship to work tasks and perceived psychosocial job stress. *Ergonomics* 41: 1510-1518.
- Halbesleben JRB, Bowler WM [2007] Emotional exhaustion and job performance: The mediating role of motivation. *Journal of Applied Psychology* 91: 93-106.
- Halbesleben JRB, Buckley MR [2004] Burnout in organizational life. *Journal of Management* 30: 859-879.
- Halbesleben JRB, Demerouti E [2005] Assessing the construct validity of an alternative measure of burnout: Investigating the Oldenburg Burnout Inventory. *Work & Stress* 19: 208-220.

- Hobfoll SE [1988] *The ecology of stress*. Hemisphere.
- Hobfoll SE [1989] Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist* 44: 513-524.
- Hobfoll SE [1998] *Stress, culture, and community*. Plenum.
- Hobfoll SE [2001] The influence of culture, community, and the nested self in the stress process: Advancing conservation of resources theory. *Applied Psychology: An International Review* 50: 337-370.
- Hobfoll SE, Freedy J [1993] Conservation of resources: A general stress theory applied to burnout. *Professional burnout: Recent developments in theory and research* (eds. WB Schaufeli, C Maslach, T Marek). Taylor & Francis.
- Hobfoll SE, Shirom A [2000] Conservation of resources: Applications to stress and management in the workplace. *Handbook of organizational behavior* (2<sup>nd</sup> ed., ed RT Golembiewski). Dekker, pp 57-81.
- Isen AM [2001] An influence of positive affect on decision making in complex situations: Theoretical issues with practical implications. *Journal of Consumer Psychology* 11: 75-85.
- Johnston JJ [1995] Occupational injury and stress. *Journal of Occupational & Environmental Medicine* 37: 1199-1203.
- Leiter MP [1993] Burnout as a developmental process: Consideration of models. *Professional burnout: Recent developments in theory and research* (eds. WB Schaufeli, C Maslach, T Marek). Taylor & Francis.
- Leiter MP, Harvie P, Frizzell C [1998] The correspondence of patient satisfaction and nurse burnout. *Social Science & Medicine* 47: 1611-1617.
- Leiter MP, Maslach C [2000] Burnout and health. *Handbook of health psychology* (eds. A Baum, T Revenson, J Singer). Taylor & Francis, pp 253-259.
- Lindstrom K, Leino T, Seitsamo J, Torstila I [1997] A longitudinal study of work characteristics and health complaints among insurance employees in VDT work. *International Journal of Human-Computer Interaction* 9: 343-368.
- Lipscomb J, Borwegen B [2000] Health care workers. *Occupational health: Recognizing and preventing work-related disease and injury* (4<sup>th</sup> ed., eds. BS Levy, DH Wegman). Lippincott, Williams, & Wilkins, pp 767-778.
- Maslach C [2001] What have we learned about burnout and health? *Psychology and Health* 16: 607-611.
- McArdle JJ [2009]. Latent variable modeling of differences and changes with longitudinal data. *Annual Review of Psychology* 60: 477-605.
- Murphy LR [2002] Job stress research at NIOSH. In *Research on Occupational Stress and Well Being* (Vol 2., eds PL Perrewé, DC Ganster). Elsevier, pp 1-55.
- Sauter SL, Hurrell JJ, Fox HR, Tetrick L, Barling J [1999] Occupational health psychology: An emerging discipline. *Industrial Health* 37: 199-211.

- Siegall M, McDonald T [2004] Person-organization congruence, burnout, and diversion of resources. *Personnel Review* 33: 291-301.
- Taris T, Kompier, M [2006] Games researchers play - extreme group analysis and mediation analysis in longitudinal occupational health research. *Scandinavian Journal of Work, Environment and Health* 32: 463-472.
- Theorell T, Karasek R [1996]. Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of Occupational Health Psychology* 1: 9-26.
- Thoresen CJ, Kaplan SA, Barsky AP, Warren CR, de Chermont K [2003] The affective underpinnings of job perceptions and attitudes: A meta-analytic review and integration. *Psychological Bulletin* 129: 914-945.
- Vahey DC, Aiken LH, Sloane DM, Clarke SP, Vargas D [2004] Nurse burnout and patient satisfaction *Medical Care* 42: 57-66.
- Waehrer G, Leigh JP, Miller TR [2005] Costs of occupational injury and illness within the health services sector. *International Journal of Health Services* 35: 343-359.
- Wright TA, Cropanzano R [1998]. Emotional exhaustion as a predictor of job performance and voluntary turnover. *Journal of Applied Psychology* 83: 486-493.

## Inclusion Enrollment Report

**This report format should NOT be used for data collection from study participants.**

**Study Title:** Linking Health Care Workarounds & Burnout to Patient and Worker Safety  
**Total Enrollment:** 587 **Protocol Number:** 1112197  
**Grant Number:** K01 OH008965-02

<b>PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race</b>				
Ethnic Category	Sex/Gender			Total
	Females	Males	Unknown or Not Reported	
Hispanic or Latino	26	2		28 **
Not Hispanic or Latino	471	57		528
Unknown (individuals not reporting ethnicity)	15	4		19
<b>Ethnic Category: Total of All Subjects*</b>	512	63		575 *
<b>Racial Categories</b>				
American Indian/Alaska Native	1			1
Asian	6	1		7
Native Hawaiian or Other Pacific Islander				
Black or African American	39	7		46
White	455	53		508
More Than One Race	3			3
Unknown or Not Reported	8	2		10
<b>Racial Categories: Total of All Subjects*</b>	512	63		575 *
<b>PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)</b>				
Racial Categories	Females	Males	Unknown or Not Reported	Total
American Indian or Alaska Native				
Asian				
Native Hawaiian or Other Pacific Islander				
Black or African American				
White				
More Than One Race	3			3
Unknown or Not Reported	23	2		25
<b>Racial Categories: Total of Hispanics or</b>	26	2		28 **

\* These totals must agree.  
 \*\* These totals must agree.