

University of Memphis

University of Memphis Digital Commons

Electronic Theses and Dissertations

2020

JUST CULTURE IN HEALTHCARE ERROR MANAGEMENT: NURSE-IN-TRAINING VIEW OF JUST CULTURE AND OUTCOMES OF EVENT INVOLVEMENT

Rebecca Roberts Quillivan

Follow this and additional works at: <https://digitalcommons.memphis.edu/etd>

Recommended Citation

Quillivan, Rebecca Roberts, "JUST CULTURE IN HEALTHCARE ERROR MANAGEMENT: NURSE-IN-TRAINING VIEW OF JUST CULTURE AND OUTCOMES OF EVENT INVOLVEMENT" (2020). *Electronic Theses and Dissertations*. 2722.

<https://digitalcommons.memphis.edu/etd/2722>

This Dissertation is brought to you for free and open access by University of Memphis Digital Commons. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of University of Memphis Digital Commons. For more information, please contact khggerty@memphis.edu.

JUST CULTURE IN HEALTHCARE ERROR MANAGEMENT: NURSE-IN-
TRAINING VIEW OF JUST CULTURE AND OUTCOMES OF EVENT
INVOLVEMENT

by

Rebecca Roberts Quillivan

A Dissertation

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

Major: Psychology

The University of Memphis

May 2020

Copyright © 2020 Rebecca Roberts Quillivan
All rights reserved

Dedication

I dedicate this work to my daughter, Anna Chapman, who gave me the most precious gift of all: motherhood. Nothing makes me happier than watching you become the person you are meant to be.

*“So come to the pond
or the river of your imagination,
or the harbor of your longing,
and put your lips to the world.*

*And live
your life”*

– Mary Oliver, “Mornings at Blackwater”

Acknowledgements

I once heard that success in any endeavor is the result of the collaboration of three factors: *ability*, *motivation*, and *support*. Take away any of one of these things, and success is much less likely. With that in mind, I want to thank those who supported me along this path. My biggest thanks to my husband, Colin. When we first met, I had just started graduate school in Memphis. We dated, he moved here, we got married, had a child, bought a house, found full-time jobs – and throughout it all, I was squirreling away time in between moments of our *life* trying to complete my degree. I spent family vacations on my laptop and lost weekends to my office. He handled these disruptions with grace, and I know that was not always easy or fair. Thank you for supporting me and giving me the space to finish this project. I love you, and I promise to never enroll in graduate school again!

I also want to thank my Mom and Dad for their unending optimism as I made my way through my doctoral studies. Nothing can ever diminish my appreciation and love for them; without their support, I would never have gotten here.

A huge thanks goes to Dr. Frank Andrasik. I did not start my doctoral work in his research lab, and when I came knocking on his door, he had no reason to take me under his wing. However, he embraced my journey, and helped me see the light at the end of the (very wordy) tunnel. I will never forget what it meant to have a truly kind, supportive mentor in my corner. Thank you also to all members of my committee who have given their consideration and time to my work. Most especially, many thanks to Dr. James Hoffman for advising both my academic and professional development. You have always given me precisely the amount of guidance and encouragement I needed.

Abstract

Quillivan, Rebecca. Ph.D. The University of Memphis. May 2020. Just Culture in healthcare error management: Nurse-in-training view of Just Culture and outcomes of event involvement. Major Professor: Frank Andrasik, Ph.D.

This experimental study assessed the behavioral and psychosocial effects of just culture error management strategies for medical errors in a healthcare setting, and the outcomes of such strategies on work-related perceptions, attitudes, and behaviors. A total of 247 nurses-in-training were randomly assigned to one of 6 experimental conditions. In each condition, participants read a vignette that described an “at-risk” medical error and the error management strategy employed by a hypothetical organization. The medical error was written to implicate both the individual involved, and the larger organizational system. Vignettes differed with regard to error management strategy employed by the organization (punitive, blameless, just culture) and the degree of event severity (no harm, harm). Participants rated the organizational justice and trustworthiness of the hypothetical organization described in the vignette; then, reported their own willingness to engage in safety compliance and error reporting behaviors and their degree of organizational commitment and attraction.

Error management strategies based in just culture were associated with increased perceptions of organizational justice and trustworthiness, increased intention to engage in safety compliance, and stronger attraction and commitment to the organization.

Furthermore, perceptions about the organizational justice and organizational trust mediated the relationship between error management strategy and these outcomes. Event severity did not moderate the association between error management and organizational perceptions. Furthermore, error management strategy was unrelated to error reporting intention. Control variables of familiarity with concepts of just culture, experience with

medical errors (as provider or patient), and demographic variables of gender and age were not associated with organizational commitment, organizational attraction, or safety compliance. However, error reporting intention was positively associated with familiarity with concepts of just culture was positively and negatively associated with experience with medical errors as a provider.

Table of Contents

Chapter	Page
1. List of Tables	viii
2. List of Figures	x
3. Introduction.....	1
4. Literature Review.....	16
5. Method	47
6. Results.....	62
7. Discussion.....	89
References.....	103
Appendices	
A. Error Vignettes.....	118
B. Survey Materials	130
C. Additional Data from Primary Analyses.....	138

List of Tables

Table		Page
1.	Participant Demographics by Experimental Condition.....	63
2.	Descriptive Statistics of Study Variables.....	64
3.	Descriptive Statistics of Study Variables by Error Management Type	65
4.	Pearson Correlations of Study Variables	67
5.	Multivariate Analysis of Covariance Tests for organizational perception variables	69
6.	Post-hoc Analysis of Variance Comparisons for organizational perception variables	70
7.	Multivariate Analysis of Covariance Tests for attitudinal variables	71
8.	Post-hoc Analysis of Variance Comparisons for attitudinal variables	72
9.	Non-parametric between-subject tests for safety behavior intentions.....	74
10.	Regression analysis for error management and severity on organizational attraction.....	76
11.	Regression analysis for error management and event severity on organizational attraction, controlling for perception mediators.....	76
12.	Regression analysis for error management and event severity on organizational commitment	77

13.	Regression analysis for error management and event severity on organizational commitment, controlling for perception mediators.....	78
14.	Regression analysis for error management and event severity on safety compliance intentions.....	79
15.	Regression analysis for error management and event severity on safety compliance intentions, controlling for perception mediators.....	80
16.	Regression analysis for error management and event severity on error reporting intentions	81
17.	Regression analysis for covariates on perceived organizational justice and organizational trust	81
18.	Overview of path model fit statistics	86
19.	Overview of multi-group severity fit statistics and model comparison.....	87
20 .	Regression analysis of error management and event severity interaction terms on organizational perceptions	87
21 .	Overview of multi-group error management fit statistics and model comparison.....	139

List of Figures

Figure		Page
1.	Hypothesized Error Management Path Behavioral Intention Path Model.....	38
2.	Hypothesized Error Management Path Attitude Path Model	38
3.	Reason's Culpability Decision Tree	43
4.	Hudson's Redefined Just Culture Model, "Hearts and Minds"	45
5.	Hypothesized Organization-Focused Attitude Partial Mediation Path Model.....	58
6.	Hypothesized Organization-Focused Attitude Full Mediation Path Model.....	58
7.	Hypothesized Individual-Focused Behavioral Intention Partial Mediation Path Model.....	59
8.	Hypothesized Individual-focused Behavioral Intention Full Mediation Path Model.....	60
9.	Organizational-Focused Attitude Full Mediation Path Model.....	84
10.	Individual-Focused Behavioral Intention Full Mediation Path Model.	86
11.	Organizational-Focused Attitudinal Partial Mediation Path Model.	141
12.	Individual-Focused Behavioral Intention Partial Mediation Path Model.....	142

Chapter 1

Introduction

Mistakes and errors are a part of every human endeavor – including performance at work (Reason, 1990). In some high-risk industries (e.g., medicine, nuclear power, aviation or rail transportation), even relatively minor errors can lead to devastating outcomes (i.e., Chernobyl). In the healthcare field, when physicians, nurses, pharmacists, and other front-line caregivers make even minor mistakes in the course of care patients can face costly, permanent, or even fatal consequences (Kohn, 2001; James, 2013). These mistakes may be as simple as a miscalculation during medication administration or omissions in bedside care (such as, failure to turn immobile patients on schedule to prevent bed sores); but may also occur in situations that require more complex reasoning and deductive skills (such as, incorrect diagnoses and non-optimal treatment approaches). Over the past decade, analyses have repeatedly revealed that hospitalized patients are unnecessarily harmed at much higher rates than expected (Kohn 2001; Kohn, Corrigan et al. 2000; Levinson & General 2010). In fact, estimates suggest that serious medical mistakes occur in 21 percent of hospitalizations, and are the third leading cause of fatalities, affecting approximately 1 out of every 6 deaths in the United States annually (James, 2013). Given that roughly 87% of medical errors lead to additional treatment requirements – further ancillary services, prescription drug services, and inpatient or outpatient care, for instance (Milliman, 2010) – the total cost of medical errors in the United States is posited to exceed \$19.5 billion a year (Andel et al., 2012). Many of these medical mistakes are preventable (James, 2013); meaning, the healthcare providers or hospital system should and/or could have behaved differently to avoid any patient harm.

As a result, managing the safety performance of frontline healthcare providers who are at risk of being involved in medical mistakes and improving the safety of the healthcare system, as a whole, is a significant priority for medical organizations aiming to reduce their rates of preventable patient harm (Reason, 1990, 1995, 2000; Reason et al., 1990).

One approach to ensuring safety in healthcare and other high-risk industries is through the adoption of employee performance management strategies known as *error management* (Reason, 1998). Like other performance management techniques, error management frequently involves applying proactive and reactive Behavioral intention-based strategies (punishments and rewards) that focus on improving various dimensions of frontline safety performance; in this case, safety-critical behaviors that ensure work is done safely, mistakes and unsafe circumstances are quickly detected or reported, negative consequences are effectively handled and minimized, and post-error learning occurs (Frese, 2008; Frese & Keith, 2015). Traditionally, healthcare organizations relied on punitive and disciplinary strategies to motivate safe behavior on the job (Reason, 1998), but recent advancements in patient safety, human factors engineering, and error research has encouraged high-risk organizations to take a more global, systemic approach to addressing harm that results from human performance variability (Karsh et al., 2006). It is now well-accepted that healthcare workers must perform their complex work within the limits (and under the influence) of their social, physical, and hierarchical work environments, and that these factors must be taken into account when adopting error management techniques (Reason, 2000).

Just Culture Error Management

Over the past decade, the most acclaimed approach to healthcare error management is *just culture* (Reason, 1998, 2000). Just culture is a hierarchical, system-wide approach to safety wherein a hospital thoroughly examines the underlying causes of errors, explicitly adopts a *just framework of accountability* for responding to medical errors that extends across all levels of an organization, and applies interventionist tactics accordingly. Fair accountability is accomplished by evaluating the extent to which various inter-related forces within the organization contribute in producing the error. Such forces may include the behavior and choices of frontline staff; decisions and priorities of organizational leaders, managers, and supervisors; technologies and work systems involved in providing care; and components of the physical and social environment, such as distraction or social norms. This organization-wide examination of root causes theoretically allows just culture to flexibly address the factors – both personnel and systemic – that contribute to errors, and implement appropriate countermeasures that can reduce their occurrence (Reason, 2000). The architect of just culture, psychologist and error researcher James Reason, argues that just culture results in an atmosphere of trust that is expected to make essential contributions to the organization's larger safety culture and performance (Reason, 1995).

Since its introduction to the patient safety literature in 2000 (Reason, 2000), just culture error management has been widely adopted by patient safety advocates, error researchers, medical associations, and patient safety organizations (PSOs) based primarily on several key hypotheses. First, just culture is expected to encourage employees to trust that the organization will not unfairly blame them for errors,

increasing the likelihood staff will transparently discuss and share their errors and other unsafe circumstances with the organization (e.g., event reporting), and will voluntarily partner with organizations to fix safety flaws (e.g., safety citizenship behaviors; Reason, 2000). When disciplinary responses automatically follow error reports, incidents are seen as something shameful, to be kept concealed, leading to the loss of much potential safety information (Dekker, 2007). Secondly, it is posited that staff members working within an environment of just culture will feel accountable for their safety behaviors; leading to safer decisions on the job, such as increased adherence to best safety practices, rules, and regulations (e.g., safety compliance). Thirdly, by emphasizing fairness in the aftermath of errors, just culture is more likely to fulfill worker's psychological needs for ethical and just management; increasing positive work-related attitudes, such as improved morale, commitment, and satisfaction. Finally, increases in safety compliance and enhanced worker psychological states are expected to improve the overall safety of the organization and reduce the likelihood errors will occur and harm patients (Reason, 2000). Therefore, the core insight of just culture is that, by emphasizing fairness *and* accountability, error management can improve the safety outcomes across the organization via more open discussion and mitigation of safety risks and failures, safer worker behaviors, and happier, motivated workers.

Despite significant theoretical discussions concerning the hypotheses of just culture error management, several fundamental questions remain unresolved from an empirical perspective. The preponderance of evidence for Just Culture's efficacy has relied upon descriptive analyses (for example: von Thaden et al., 2006; Waring, 2005) and correlational, field experiments (for example: Butler, 2015; Connor et al., 2007)

where extraneous variables may influence the results in unknown ways (Peterson et al., 1982). Therefore, the causal relationships between the key safety-critical behaviors (safety compliance, event reporting) and just culture techniques have not been empirically validated. Secondly, it is not well understood whether just culture error management techniques are indeed interpreted as “just” by the frontline staffers to which they are applied; or whether various factors, such as outcome severity and demographic variables, impinge upon these interpretations. It could be that demographic and error-specific variables directly impact how error management techniques are perceived by individuals, and therefore, should be added as control variables.

By extension, no empirical evidence links just culture techniques to staff trust – the hypothesized mediating variable at the core of just culture approach. Finally, the impact that just culture error management techniques have on other operational and safety-relevant variables related to employee retention and satisfaction, such as commitment to the organization, and attractiveness for employment have not been explored. Given that the medical field historically experiences poor employee retention rates (Hayes et al., 2006), high degrees of burnout (Shanafelt et al., 2002), and low employee satisfaction (Bhatnagar & Srivastava, 2012), the impact of any error management technique on these work-related perceptions is potentially relevant.

Purpose of the proposed research project

In light of these remaining questions, this project seeks to examine the hypothesized but untested causal relations between the just culture error management approach and frontline perceptions (organizational justice, organizational trustworthiness), intention to engage in safety-critical behaviors (safety compliance,

event reporting) and organization-focused work attitudes (attractiveness for employment, organizational commitment), using a vignette-based experimental research design.

Furthermore, this project seeks to examine the hypothesized mediating influence of organizational perceptions (organizational justice, organizational trustworthiness) on the relations between error management and safety behaviors (compliance, reporting).

In addition, this project explored the degree to which event outcome severity impacts the organizational perceptions of justice and trustworthiness and/or constrains the association between error management and perceptions. Finally, the analyses control for extraneous variables of age, gender, experience with medical errors, and familiarity with concepts of just culture. The following sections will outline the major research questions associated with the current study, followed by key term definitions, and statements about the significance and limitations of the present research.

Major Research Questions that guided the Research Hypotheses

- a.* Does just culture error management increase perceptions of organizational justice and organizational trust compared to punitive or blameless error management?
- b.* Does just culture error management increase likelihood of engaging in safety-focused behaviors, such as safety compliance and error reporting, compared to punitive or blameless error management?
- c.* Does just culture error management increase positive organizational attitudes, such as attraction for and commitment to the organization compared to punitive or blameless error management?

- d. Do perceptions of organizational justice and trust mediate the relationship between error management and behavioral intentions (safety compliance, event reporting)?
- e. Do organizational perceptions (justice and trust) mediate the relationship between error management and work-related attitudes (organizational attraction, organizational commitment)?
- f. Does severity of the event moderate the relationships between error management and organizational perceptions?

Definition of Terms

Just culture error management. The primary concept behind just culture is that effective error management seeks to maximize accountability for safety by addressing the specific underlying causes of errors, whether individual or system/organizational. As such, just culture flexibly combines components of the punitive and blameless strategies, depending on the unique circumstances in which errors arise. For example, if a medical error is determined to have system cause, individuals are met with some combination of consolation, emotional support, and/or additional training in combination with system-focused solutions (Reason, 2000). However, if a medical error arises because individual workers have behaved recklessly (repeated similar mistakes, working under the influence, blatant disregard for safety, etc.), just culture requires they face some form of punitive consequence. To adequately respond to a given medical error, just culture involves a holistic, system-focused assessment of protocols, policies, and environmental factors, as

well as thoughtful consideration of personnel variables, such as prior behaviors, motivations, etc. (Kohn et al., 2000; Reason, 1997; Muething et al., 2012).

Punitive or person-focused error management. Punitive error management refers to proactive and reactive management strategies that emphasize the role of punishment in ensuring workers behave safely on the job (Reason, 1995). In practice, organizations that employ punitive strategies respond to medical errors by applying reprimand, personnel review, demotion, dismissal, or other disciplinary treatments to the individuals involved in the error, and rely on fear campaigns to keep workers vigilant in their safety practices (Reason, 2000). In some extreme cases, healthcare workers have been fired, stripped of licensure, criminally prosecuted, and spent time in jail after committing errors in the course of care that resulted in serious harm or patient death.

Blameless or system-focused error management. Blameless error management refers to proactive and reactive strategies that utilize compassion for healthcare workers, and emphasize the importance of trust building in ensuring that safety is maximized at work (Reason, 1995). In practice, organizations that employ blameless strategies respond to medical errors with emotional support and consolation; encourage providers to openly and fearlessly discuss their errors and the circumstances that surrounded the error. Unlike punitive strategies, blameless error management holds the organization responsible for addressing unsafe conditions that resulted in medical error. In this way, the individual healthcare worker involved in the error is treated with a blame-free response.

Organizational justice. The concept of organizational justice emphasizes fairness as a consideration in the workplace (Greenberg, 1990). Organizational justice, therefore,

refers to the extent to which employees perceive the organization to behave in a just manner with regard to its employees, which involves equitable and deserved treatment across a variety of domains (pay, promotion, etc.). In traditional organizational literature, there are three distinct components of organizational justice: distributive justice is primarily concerned with fairness of outcomes (Adams, 1965), procedural justice involving fairness of processes and procedures (Thibaut & Walker, 1975), and interactional justice involving fairness of interpersonal treatment (Greenberg, 1990). In addition, interactional justice can be further distilled into two categories: interpersonal justice refers to the degree to which individuals are treated politely and with dignity and respect, whereas informational justice focuses on the explanations provided to people that convey information about procedures and outcomes (Bies & Moag, 1986).

Organizational trust. The concept of trust appears in a variety of social science literatures and is widely regarded as “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” (Rousseau et al., 1998, p. 395). In this context, trust refers to the extent to which employees place high confidence in their work setting, believing strongly and unabashedly that the future conduct of the organization will be positive (Lewicki et al., 1998). Individuals displaying a high level of organizational trust are described as being willing to rely on the organization despite the risk that it might not follow through on its obligations (Colquitt et al., 2007). Empirical research has also shown that trust is related to the removal of psychological barriers that stifle improvement in the quality of a relationship, such as the delegation of crucial tasks to others, rejection of safeguards, and full disclosure of information (Colquitt et al., 2007).

Safety compliance behaviors. Safety compliance behaviors refers to following safety rules, regulations, policies, procedures, avoiding unsafe behaviors and risk-taking, and adhering to the dictates of safety expectations at work (Mearns et al., 2003). Safety compliance behaviors generally refer to the safety expectations hospitals have for frontline staffers; for example, maintaining a sterile field during invasive procedures, engaging in hand hygiene behaviors, or following bed-turning protocols. Safety expectations are typically role- and task-based; i.e., employees in certain positions are provided specific safety guidance for their job tasks, and completion of these tasks in a safe manner is considered central to their job performance. Therefore, failure to comply with safety regulations can have serious health consequences for patients, such as development of infections and other hospital-acquired conditions (e.g., pressure injuries). As would be expected, organizations exhibiting low safety compliance rates have increased risk for medical errors and hospital-acquired infections and reduced satisfaction among employees (Barling et al., 2003; Ayim & Gyekye, 2005; Song et al., 2007).

Event reporting. Event reporting is the purposeful sharing with the organization when employees learn of, or are personally involved in, patient safety events or medical errors. Event reporting typically involves using a computerized event log or software system that collects event-related information from frontline staff and shares it with the hospital's risk management, quality management and improvement, or patient safety teams. In many cases, event reporting can be accomplished anonymously (Suresh et al., 2004). Event reporting is vital to an organization because of the information that it provides about frequent medical errors, possible system failures within the organization,

and other risks to patient safety. Despite critical nature of information involved, the vast majority of medical events and errors go unreported (Waring, 2005).

Organizational commitment. Organizational commitment refers to individual's identification with and participation in the organization (Mowday et al., 1979). Allen and Mayer (1990) proposed that three different mind-sets underlie organizational commitment: affective commitment, normative commitment, and continuance commitment. Affective commitment is driven largely by positive emotional feelings about an organization (O'Reilly & Chatman, 1986). Normative commitment is driven by moral obligations. Continuance commitment is driven by feelings of commitment that result from the growing cost of accumulated investments in a particular course of action that would be lost if one were to change ways (Meyer & Parfyonava, 2010). Organizational commitment is thought to positively affect organizational performance and quality of work by decreasing the occurrence of undesirable results, such as tardiness, absenteeism, and quitting (Meyer & Allen, 1988).

Organizational attraction. The concept of organizational attraction refers to the degree to which an individual (typically, an applicant) is attracted to an organization as potential employer; or the general desirability of an individual to work for an organization. Organizational attractiveness research seeks to understand what organizational characteristics attract individuals, or particular types of individuals, to apply for a position at an organization, or pursue and accept a job offer (Williams, 2013).

Significance of the problem and justification

Given the number of preventable errors affecting the healthcare system annually, hospitals and healthcare administrators face increasing pressure to improve safety records with demonstrable, proven, evidence-based strategies. Simultaneously, the impact on workforce morale must be included in a comprehensive review of organizational strategies available to healthcare administrators. It is hoped that the findings of this study will provide empirical evidence for several important, unanswered questions in the field of healthcare error management. First, this study examines the degree to which error management impacts employee perceptions of organizational justice and trust; both of which are related to key hypotheses in the just culture literature. Secondly, this study will help illuminate the role of error management in creating safer workplaces (via increased behavioral intentions for safety-critical behaviors), as well as, encouraging organizational readiness (via organizational commitment and attraction).

Importantly, the concepts of system-based solutions and just culture have permeated the field of patient safety for roughly two decades. However, expected consequent reductions in error rates and perceptions of punitive treatment have failed to materialize at a national level (Sorra et al., 2012). Several reasons may account for this state of affairs. First, just culture may be an effective tool for error reduction, but it has not been applied evenly or appropriately in various healthcare settings. In fact, evidence suggests that some just culture implementations have managed to leave an underlying culture of blame in place, such that punishment is emphasized and a focus on frontline worker accountability rather than management or systemic accountability is pervasive (Hudson et al., 2008). If this were the case, one would expect that the hypothesized

outcomes of just culture (improved trust, increased sense of justice, increased safety-critical behavior) would emerge when examined with rigorous experimental methods. Alternatively, just culture may not be an effective tool for achieving the outcomes hypothesized in the literature; and more appropriate techniques need to be uncovered.

Answers to these questions will aim to provide significant benefit to healthcare administrators hoping to utilize an effective error management program to reduce their overall patient harm, while also maintaining a motivated, engaged, and committed workforce. Through this exploration, a greater understanding of the impact of error management on frontline workers may be gained, and critical empirical evidence may warrant investment in the key initiatives around error management. Alternatively, should the study hypotheses not be met, this research could signal that further scrutiny be placed on the just culture claims. Ultimately, this research will provide direction for those who seek to improve the quality and safety of modern healthcare through error management tools. Given the significant financial, operational, and public-relation burden healthcare errors incur on institutions, hospital administrators are eager for solutions that will increase reporting and reduce harm.

Basic assumptions and limitations

The present study has several limitations that restrict the generalizability of the findings. First, the proposed methodology utilizes a convenience sample of nursing students from a single, large urban university. Convenience samples can be problematic for experimental research, and may result in findings that are unique to the specific culture, geographic region, university, education, or curriculum of the sample. Nurses-in-

training likely differ from working healthcare professionals in a variety of ways, including (but not limited to), robust medical experiences and involvement with medical errors, tenure within healthcare organizations, income level, and age. Therefore, caution must be applied to these findings when considering the impact of error management strategies on currently employed healthcare professionals. A third limitation of this study centers on the use of research vignettes as the experimental manipulation. Vignettes are used throughout the social sciences; although their use in nursing research is less developed (Hughes & Huby, 2002). Vignette-based research has several advantages: mainly, research can be easily conducted on topics that are difficult to simulate in experimental labs, and on attitudes or behaviors that are sensitive for participants. However, vignette-based research must also address potential issues of ecological validity. The use of manipulation checks and subject-matter expert reviews will likely increase the confidence researchers can have in the ecological validity of their vignettes. Despite these limitations, much may still be gained from surveys of nurses-in-training and their perception of a hypothetical organization following vignette error management descriptions; these individuals will be entering the healthcare workforce and will be exposed to various forms of error management from potential employers, and will be vulnerable to medical errors (West et al., 2006, Singh et al. 2007). Furthermore, as students, nurses-in-training are familiar with the challenge that medical errors pose for the healthcare profession, and are less likely to be influenced by real-world conflicting factors that may limit the impact of error management (robustness of job market; satisfaction or dissatisfaction with other components of the work or organization,

colleague social support, performance reward systems, etc.). A more detailed explanation of the study limitations will be presented in later chapters of this study.

Summary and transition to Chapter II

Error management plays an integral role in the overall safety and effectiveness of the healthcare system. Due to several highly publicized reports on medical errors, the healthcare system has faced increased scrutiny regarding the degree to which patients are harmed during the course of seeking medical care. The field of error management arose, in part, to develop key organizational interventions that will reduce the likelihood that errors reach patients and cause unnecessary harm. *Just culture* has been promoted as the gold standard of error management; primarily because it is expected to increase several types of safety-critical behaviors, while simultaneously developing a transparent, accountable, and trusting work environment for employees. In addition, it is expected that *just culture* will have a positive impact on employee work-related attitudes that are critical for organizational success. High levels of these attitudes are desirable for an industry that famously struggles with retention, burnout, and low satisfaction. In the next Chapter, a thorough review of the Just Culture literature will be presented, and the theoretical foundations that underlie the study hypotheses will be discussed.

Chapter 2

Literature Review

Healthcare error management has drastically transformed in the last two decades. For most of the 20th century, the traditional approach to error management in healthcare relied heavily on punitive strategies, such as blaming and punishing individuals for errors, scolding against carelessness, and threatening punishment for future mistakes. Called the *person* or *punitive approach* (Reason, 2000), this perspective focused on unsafe actions made by people at the “sharp end” of care: nurses, physicians, surgeons, anesthesiologists, pharmacists, and others. The *person approach* operates according to a cognitive framework known as the “just world hypothesis” (Montada, 1998), wherein an individual’s consequences (whether good or bad) are assumed to be morally deserved. From the perspective of medical errors, the just world theory emphasizes personal responsibility for errors and their outcomes (Reason, 1998). In this way, individuals who commit medical errors do so because of some personal attribute, failure, or condition; not due to randomness or environmental factors.

Though common for many decades in the medical field, the *punitive approach* came under scrutiny in the mid-1990s, when researchers, hospital administrators, and even frontline healthcare workers began to speak out about the negative effect of blame on employee health and satisfaction (Reason, 1995; Kohn et al., 2000; Wu, 2000). In the pivotal IOM report (Kohn et al., 2000), the *punitive approach* was widely critiqued for the lack of improvement in the field of patient safety. The reasoning for this critique was that a singular emphasis on the person at the sharp end of care ignored critical features of the overall healthcare system that could contribute to patient harm. As a result, patient

advocates, researchers, and hospital administrators largely embraced the notion that punitive strategies must be abandoned for true progress in safety to begin.

Rather than focusing on individual practitioners, the IOM report argued that unsafe organizational “systems” must be addressed (Kohn et al., 2000), giving rise to the perspective known as the *system approach*. The *system approach* (Reason, 1995) argues that most errors originate from “blunt end” organizational factors – environmental, social, and otherwise – that make safe behavior less likely, by increasing the likelihood for errors, setting perverse incentives that encourage unsafe behavior, or making correction more difficult. Based on a psychological understanding of human performance variability (Normal Accident Theory; Perrow, 1984; and Behavioral Drift), proponents for the system approach argued that human errors are normal and predictable by-products of any human endeavor; and should be treated as such. For instance, healthcare workers perform complex work tasks, make difficult decisions under ambiguous circumstances, operate in highly distracting workspaces, and often juggle competing priorities within environments that can either optimize or threaten safety. In the best cases, the social, physical, and hierarchical environments encourage, even force, the safest possible outcomes (i.e., medication bar code scanning prevents wrong patient drug administrations). However, in many cases, errors arise under circumstances that serve to increase their likelihood (i.e., computer software that is confusing or unintuitive; critical calculations that rely on mental math rather than automated processes; potentially harmful drugs whose appearance is very similar to innocuous drugs). The *system approach* acknowledges that even the most competent and careful workers will make mistakes; even the most

motivated workers will (under certain conditions) sometimes drift from standard procedures (Reason, 2000).

The famous 2009 case involving lead pharmacist, Eric Cropp provides an illustrative example. Cropp made a lethal error that resulted in the death of two-year old patient, Emily Jerry. Upon further review of the circumstances surrounding the event, several systemic factors were identified: the error happened on a busy Sunday morning with low staffing; Cropp was stressed, tired and hungry, having been unable to take any breaks during his shift; routine maintenance of the pharmacy computer system caused a back-up in ordering; labels of the IV admixtures were printed later than usual, causing a delay (and subsequent rush) in preparing solutions; the chemotherapy order was incorrectly ordered as STAT, resulting in pressure to fill order quickly; several vials of the sodium chloride solution were left on a crowded table, and the technician answered in the affirmative when asked whether she had used sodium chloride, but Cropp did not confirm which of the solutions had been used on the Jerry order. According to the *system approach*, this combination of systemic factors (busy workday, rushed orders, incorrect orders, technological delays, workstation circumstances) increased the likelihood that Cropp made his crucial mistake (failed to detect the technician's error) and proceeded to dispense the incorrect solution that resulted in Jerry's death. Unfortunately, Cropp's situation is not uncommon. In fact, a study into accident injury to patients hospitalized in New York during 1984 (Leape et al., 1991) found that a quarter of the injuries reviewed were initially deemed to involve negligence by the individual staff member. However, a deeper examination of the incidents highlighted factors beyond the control of the individual that played pivotal roles. Further, over half of the incidents reviewed were

deemed to be caused by errors in management, many of which were underpinned by high patient volumes and over-extended staff (Leape et al., 1991). Some errors that initially appeared to be negligence were often not due to an individual's incompetence or disregard for the standard, but rather their ignorance of what the standard was. This was preceded by poor dissemination and reinforcement of practice guidelines: systemic issues, rather than issue with the individual practitioners. By employing a *systems approach*, the IOM report argued that organizations can make meaningful and far-reaching changes to that will reduce “sharp end” errors and other unsafe behaviors, or contain them in order to keep patients safe (Kohn et al., 2001). Hospital administrators were encouraged to respond to errors and unsafe behaviors with blameless strategies – providing compassion and understanding for frontline workers in difficult situations; developing blame-free reporting systems, and fostering an environment where errors were primarily considered “learning opportunities” that would result in system-level fixes. As a result, much optimism existed for the future of patient safety as a field at the beginning of the 21st century.

Unfortunately, applying blameless strategies to real-world scenarios have proven difficult to implement (Bagain, 2006), and have been discouraged by seminal voices in the field of patient safety (Reason, 1997). At times, some healthcare workers truly behave recklessly and knowingly put their patients in danger, leaving system-focused hospital administrators ill-equipped to respond (Bagain, 2006). In these cases, a blameless culture would be neither feasible nor desirable, as some unsafe acts cannot be tolerated within a healthcare environment. For instance, in 2011 in the United Kingdom, a nurse knowingly distributed lethal levels of saline to his patients, killing two (Field, 2008). In 2014, a

Dallas hospital was sued after a neurosurgeon, accused of drug and alcohol addiction, botched several surgeries under the influence; including one in which a patient bled to death and another that left the patient a quadriplegic. In 2009, a Denver hospital discovered that a surgical technician had been abusing an injected painkiller, and replacing the used syringes with saline or water. As a result of her actions, thousands of patients were exposed to hepatitis C (Brown, 2010). In addition, there are examples of less sensational risky behavior: a nurse repeatedly ignoring key safety protocols despite warnings; a physician who fails to address an obvious, emerging medical situation with appropriate concern or intervention; a technician who breaks protocol in an effort to wrap up his/her shift early. It was argued that an organization operating within a no-blame culture – where extreme risk-takers or habitual rule benders/breakers are immune from punishment – would erode safety and worker motivation to remain error-free, reduce levels of trust and employee morale, and undermine management credibility (Reason 1998, Khatri et al. 2009).

Following the IOM report, Marx (2001) published a widely-read *just culture* primer for healthcare that aimed to address the flaws inherent in the blameless and punitive approaches. Unlike the previous approaches, Marx maintained that applying *just culture* error management allows hospitals to flexibly address the unsafe systemic features of healthcare work, while also holding individual workers accountable for safe practices and punishing egregious abdications of duty. This view had support from leaders within other high-risk industries, where similar practices had been implemented, and was quickly embraced by experts and administrators alike. Implementation of a just culture approach involves the adoption of algorithm-based decision-making following an

error. If the algorithm indicates that punitive responses are appropriate, one is provided. Alternatively, if the algorithm indicates that systemic issues, such as poor training, poor safety culture and norms, ill-conceived managerial decisions and priorities, technical and environmental problems, or other external factors had a significant effect on the frontline provider involved in the error, more moderate error management approaches are suggested (consolation, training, coaching, and warnings), and system-based fixes are developed.

Despite the widespread embracing of just culture principles, punitive strategies associated with a person approach remain common and improvements in healthcare safety are lagging. Five years after the IOM report, a follow-up report was published with equally dismal descriptions of healthcare safety and medical error rates (Bleich, 2005). In fact, some ten years after the original IOM report was published admonishing punitive strategies, Eric Cropp was fired, fined, stripped of his license, and ultimately imprisoned for his unintended medical error. In 2012, a report published by the Agency for Healthcare Research and Quality (AHRQ) found that only 44% of surveyed healthcare providers describe the response to error at their organization as “nonpunitive” (Sorra et al., 2012). It is clear that just culture and systemic error management have neither been fully adopted nor fully successful at the national level; however, the following section describes evidence suggesting that the hypothesized outcomes can and will be realized when implemented effectively.

Literature Review

The following section will address theory. First, the theoretical justification for just culture error management will be described. Next, each hypothesized outcome of just culture will be addressed separately, including relevant evidence and theory for the hypothesized associations. Efforts will be made to highlight opportunities or gaps within the literature that need addressing. Finally, a summation of common just culture algorithms will be provided.

Just Culture Error Management Theories

Just culture error management relies on three theoretical foundations: Equity Theory, Trust theory, and Social Exchange Theory. In organizational settings, Equity Theory (Adams, 1965) has informed the literature on organizational justice and has been used to explain how perceptions of justice may arise in employment settings. In brief, Equity Theory argues that equity, or fairness, is driven by the degree to which an individual's outcomes or consequences involve (1) *outcome fairness*, or a balance between an individual's inputs (their contributions or costs) and outputs (their results or gains), and (2) *social comparison*, or a similarity of the output to a referent other. Roughly, fair outcomes will be those that are deserved or earned, and are applied consistently within relevant groupings. Alternatively, when contributions are high/costly and the returns are low, or vice versa, and consequences are not distributed similarly among the group, an individual is likely to perceive the outcome to be unfair or unjust. Perceptions of equity can be applied to individual events, as well as, to global interactions with persons, organizations, groups, governments, etc. In organizational literature, this

perception of fairness about the behavior of the organization is known as *organizational justice*.

Perceptions of organizational justice are socially-constructed and strongly influenced by subjective intuitions (Greenberg, 1987, 2000). According to organizational justice literature, employees form opinions about three main organizational behaviors: whether decisions about the distribution of resources and other outcomes are fair, known as *distributive justice*; whether procedures and processes that lead to decisions are fair, known as *procedural justice*; and whether the interpersonal treatment employees receive as decisions are made is fair, known as *interactional justice* (Greenberg, 2000). Although less common in organizational research, distributive justice may also be applied to the decision outcomes associated with the punishment for wrongdoing (a form of distributive justice termed, *retributive justice*). In general, punishments are held to be just to the extent to which they take into account relevant criteria such as the refutability of the evidence, the seriousness of the crime, and the intent of the perpetrator (all components of outcome fairness, or degrees of deservedness); and discount irrelevant criteria, such as race, gender, relation, or social status (reflecting concerns about social comparisons; Greenberg, 1987).

Equity theory additionally argues that the experience of inequity causes a person to feel distress, which may be reduced through efforts to restore actual or psychological equity (Adams, 1965). One may modify contributions (inputs), by either increasing their contributions or reducing them, may change their perception of the inequity (convince themselves it is fair), or may withdraw from the unfair interaction altogether (Walster et al., 1973) In other words, equity theory predicts that individuals are unlikely to statically

remain in situations they deem unfair or unequal at-will; rather, one will be motivated to achieve a balance within that interaction, even if it comes at some cost.

Mayer's Integrative Organizational Trust theory (Mayer, Davis, & Schoorman, 1995) highlights the underlying hypotheses of just culture: specifically, that fair treatment generates the formation of trusting relationships between the organization and the employee. The theory specifies the characteristics of the trustee that are required to develop and maintain trust: *ability*, *benevolence*, and *integrity*. Ability is the amalgamation of skills, competencies, and characteristics, which enable a party to have influence within some specific domain(s). For most people, this ability will be limited to a single domain, such as clinical work or financial management, although trusting someone's ability in less concrete skills may cover a number of domains (Zand, 1972). Benevolence is the extent to which a trustee is believed to want to do good to the trustor. Trustees show that they understand and value the trustor and intend to do good to them. Finally, integrity involves the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable. Such issues as the consistency of the party's past actions, credible communications about the trustee from other parties, belief that the trustee has a strong sense of justice, and the extent to which the party's actions are congruent with their words all affect the degree to which the party is judged to have integrity (Mayer et al., 1995). According to this theory, in order to engender trust in organizational settings, members must demonstrate their ability to create desired outcomes, their goodwill towards others, and the acceptability of their values and principles. The type of trust which is the least difficult to establish is that which comes through the accumulation of direct or indirect experience with the trustee – experience

that provides formative understanding of his or her integrity, benevolence, and ability. Therefore, the main drivers for higher organizational trust arise from actions and interactions with organizational agents (leaders, managers, etc.) at every level (Firth-Cozens, 2003). A growing consensus points to the importance of trust in improving general organizational functioning: such things as group cohesion, job satisfaction and organizational effectiveness (Driscoll, 1978; Mishra & Morrisey, 1990; Podsakoff et al., 1996).

Social Exchange Theory (SET; Homans, 1959) can be used to understand the relationship between error management and employee safety attitudes and behaviors. SET has its origins in sociology (George Homans, Peter Blau), behavioral psychology (B.F. Skinner, Albert Bandura), social psychology (Thibaut & Kelly), economics (D. Ricardo, Adam Smith, J.S. Mill) and anthropology (Levi-Straus). The underlying framework that unites many of these perspectives is that individuals behave for profit or the expectation of profit. Across a wide variety of circumstances, behaviors are seen as profitable when the reward for the behavior (e.g., positive consequences, needs met) outweighs the cost of the behavior (e.g. negative consequences, punishments, effort expenditure). Out of this very basic desire to seek rewards and avoid costs, individuals create sets of strategies that they believe will increase the odds in their favor when interacting with others. SET describes how complex social relationships can be understood as a series of “exchange interactions” between dyadic partners (Emerson, 1976) that either support or discourage the likelihood of favorable personal outcomes. Exchange interactions are behaviors directed to one’s dyadic partner; for example, a kind or friendly gesture. Individuals perform behaviors that are likely to return favorable

outcomes from their exchange partners (i.e., the behavior is profitable) and avoid those that will return unfavorable outcomes (i.e., the behavior is unprofitable).

Social exchange relationships function by certain “rules” of exchange (Cropanzano & Mitchell, 2005), which can be used to make predictions about how relationships will evolve. The most common exchange rule across all settings is *reciprocity*, or repayment in kind. In reciprocity, one member of the dyad may be seen as initiating positive or negative exchanges towards the exchange partner. Under the rule of reciprocity, these initial exchange behaviors generate a sense of obligation in the receiving partner, and prompt them to produce a reciprocal response. When the initial exchanges are perceived to be kind or favorable, reciprocity dictates that the partner will generate kind and favorable responses in return. In fact, research has shown reciprocity to be a strong influence in determining exchange behavior, even when the original favor or kindness was not wanted, or was provided by an unfavorable partner. Alternatively, unkind actions will likely elicit obligations for unkind responses (Gergen et al., 1980). When parties abide by the reciprocity rule, SET posits that relationships are most likely to develop into trusting, loyal, cooperative, and mutually beneficial commitments (Homans, 1959). Specifically, a self-reinforcing cycle can emerge: the expectation that one’s kind actions will be returned encourages individuals to extend initial acts of kindness or cooperation towards those with whom they enter into a long-term relationship (Emerson, 1976). Alternatively, when exchange actions are negative and retaliatory, the cycle may lead to severe breakdown in cooperation or rising tensions.

SET has been used to characterize a variety of relationships, including those between romantic dyads, work partners or teams, institutions, governments, and relevant

to this study, between employees and various organizational targets. Within an organizational setting, the presumption in SET is that workers will form distinguishable social exchange relationships with multiple work targets simultaneously: immediate supervisors (Liden et al., 1997), coworkers or team members (Cox, 1999), customers (Houston et al., 1992), and even employing organizations (Moorman et al., 1998).

Literature and Theories that form the basis of study hypotheses

Organizational justice. This study hypothesizes further that just culture will be associated with increased perceptions of organizational justice compared to punitive or blameless culture (Hypothesis 1). Just culture advocates argue that perceptions of organizational justice will be enhanced under a just culture, as compared to either a punitive or blameless error management approaches. There are several reasons to assume that just culture would promote perceptions of organizational justice compared to punitive or blameless error management. As discussed in the previous section, justice perceptions are enhanced under conditions of outcome deservedness and consistency with social comparisons (Equity Theory; Adams, 1965). Organizations that establish protocols to provide fair and honest assessment of the real causes of errors, are more likely to balance the inputs and outputs of individual workers throughout the error management processes. Further, just culture guarantees that these same processes will be applied consistently, via explicit rules and algorithms, across all individuals in the organization. More generally, findings in organizational literature suggest that justice perceptions depend on adherence to distributive justice, as well as, to procedural justice rules (Thibaut & Walker, 1978). Procedures that allow participants to have a voice will be considered fairer than a procedure that prohibits participations from having their say,

explaining their views, or expressing their needs. Just culture requires that organizations examine the error from the perspective of the individual healthcare worker involved.

Although achieving both fairness and the perception of fairness is critical to the just culture mission, few research studies have examined the relationship between just culture and frontline perception of justice. Battard (2017) studied the effects of a just culture training program on a single healthcare institution. The results suggest that just culture is associated with improved perception of nonpunitive response to errors (Battard, 2017), a key dimension in the organizational safety culture (Sorra & Dyer, 2010) but not a true measure of justice. In fact, one would expect that perceptions of a nonpunitive response to errors would increase under any systemic approach, be it just culture or blameless culture. In addition, von Thadden et al. (2006) found that just culture implementation resulted in an increased sense of organizational accountability and responsiveness for some workers (physicians reported greater sense of accountability and responsiveness compared to nurses). However, again, these measures fail to specifically address a sense of justice or fairness within the organization. To date, researchers have not provided specific evidence to conclude that just culture improves the perceptions of fairness or organizational justice among employees.

Organizational trust. Just culture is expected to be associated with increased perceptions of organizational trust compared to punitive or blameless culture (Hypothesis 2). Just culture advocates argue that trust plays a central role in the association between just culture and its associated outcomes (Reason, 1997), specifically error reporting. Evidence suggests that trust is important for safe, positive and transparent work environments; breakdowns in trust can result in increases in defensiveness about errors,

unwillingness to examine the cause of accidents, loss of regulatory legitimacy in the eyes of the regulated (Gunningham & Sinclair, 2008), reduced likelihood to report errors, and loss of confidence that they will not be blamed for mistakes (Burns, Mearns, & McGeorge, 2006).

The assumption that just culture will be associated with improved perceptions of trust is based in theory. Jeffcott et al. (2006) argue that individuals act within institutional contexts, and construe trust as a set of attitudes and expectancies about other people and the organizational systems within which they are embedded. In such contexts, displays of organizational justice are a key signal of trustworthiness (Moorman & Bryne, 2005). Trust is particularly important in organizations that deal routinely with risk and uncertainty and the possibility of significant consequences because employees risk exploitation when they affiliate and cooperate with corporations around issues such as medical errors and on-the-job mistakes. As such, the degree to which just culture error management interactions signal that organizations are able to effectively respond to errors (ability), care and value employees (benevolence), and act within an acceptable value structure (integrity), one would expect that trust would increase. In fact, advocates of just culture error management argue that the careful balance of system- and person-based principles in responding to errors are designed to maximize these very attributes: signaling ability to manage errors, care for employees and their difficult work circumstances, and a fairness value structure within an organization. In just culture, leaders acknowledge the very real difficulties of clinical care – the stress involved, the lack of resources and, above all, the real anxiety that comes from making errors – and aim to respond with fair objectivity. In order to engender the trust of staff, leaders

demonstrate their values and principles by, for example, keeping their word that errors will be treated fairly, taking into account the system and context of the incident when implementing error management.

Empirical evidence has shown consistent linkages between fairness and trust (Lewicki et al., 2005). Furthermore, results from organizational research points to some general findings about the types of conditions that promote trust within organizations. In general, organizations need to have higher staff participation in decision-making, more openness of communication (Clark & Payne, 1997), provide high job security, and – especially relevant to the current study – exhibit *procedural justice*, deliver *fair rewards and punishments*, and provide *ethical work environments* (Carnevale & Wechsler, 1992; de Cremer & Sedikides, 2005). Whitener et al. (1998) found that trust increases under cultures characterized by “inclusiveness, open communication and valuing people” where managers are rewarded for “collaborating, sharing information, explaining decisions, discussing issues openly and showing concern”. Given that just culture is designed to maximize clear communication about expectations of safe behavior, and provide fair treatment in terms of the types of errors that attract disciplinary procedures, one would expect that these features would increase the sense of trust employees’ experience. In addition, good supervisory relationships have a very strong positive effect on reported levels of organizational trust (Clark & Payne, 1997). The quality of this relationship has been found also to depend on feedback, supervisor confidence and support, *fairness of reward and punishment*, approachability, openness of communication, and opportunity for participation. Finally, researchers have argued that an organization’s culture holds the capacity to affect trust; that is, a positive safety culture – the shared sense among

employees of how the organization operates with regard to safety – will affect trust. Just culture is frequently described as a subcomponent to a larger safety culture (Reason, 1995); however, literature reviews of the factors measured in association with safety culture (Flin et al., 2000; Guldenmund, 2000) have shown that trust is rarely measured. When questionnaire items about trust are included, they usually consist of one or two (Mearns et al., 2000), and they are not linked explicitly to just culture.

Although trust is central to the concept of just culture, only one study has explicitly examined the associations between a just culture program and organizational trust among impacted staff. Within the railway industry, Mutler (2011) found that the adoption of just culture was related to greater reports of trust and increased safety communication among rail personnel. Relatedly, Jeffcott et al. (2006) used qualitative evidence to suggest that a range of factors associated with just culture, including appropriate supervisory response to safe/unsafe conduct, management commitment to safety, and directives that prioritize safety over speed or schedules, operate on important trust relationship within train operators in the U.K. railway industry. Some evidence suggests an organization's response to errors can significantly impact the degree to which employees will feel trusting towards the organization (Gunningham & Sinclair, 2008). For example, when a more adversarial and blaming approach was initiated in response to a rail accident, trust between the regulator and those being regulated was found to be significantly damaged (Gunningham & Sinclair, 2008).

Error reporting. This study hypothesizes that (a) just culture will be associated with increased error reporting compared to punitive or blameless culture (Hypothesis 6); and that (b) the relationship between error management and error reporting is mediated

by perceptions trust (Hypothesis 8). Several real-world correlational associations between just culture and error reporting behaviors have been reported in aviation, rail, offshore oil and gas industry (Høivik, 2010; Hudson et al., 2007; Turner et al., 2005; von Thaden & Hoppes, 2006), nuclear safety (Reiman & Norros, 2002) and healthcare (Dekker, 2007); and the available evidence suggests that just culture may improve error reporting. For instance, the implementation of a just culture program was associated with an increase of recordable injuries at The Norwegian Petroleum Safety Authority (Høivik, 2010), and a significant increase in reporting of aviation incidents, particularly of ‘low risk’ events and near misses (von Thaden & Hoppes, 2006). In the UK, as a consequence of the just culture implementation in healthcare, incident reporting improved significantly. For example, between October and December 2004, the total number of incidents reported in England and Wales reached 26,508 compared to the previous year when 158 incidents were reported. The period from January to March 2011 show the total number of incidents reported climbed to 312,98051. These figures show clearly the dramatic change in the health industry’s reporting culture. In addition, Barnsteiner and Disch’s (2017) work found that that the implementation of a Just Culture Model in the nursing educational facility helped students better understand that they can report near misses or errors without fear of being dismissed from the nursing program for making “honest” mistakes. In contrast, Waring (2005) examined semi-structured interviews with medical professionals and found that a culture of blame in the aftermath of errors inhibits medical reporting.

Although this evidence provides some support for the association of just culture on error reporting, it is not clear that just culture *itself* accounts for the reported increases

in reporting across these studies. All studies utilized a quasi-experimental design, lacked a control condition, and failed to address potential confounding factors, such as increased emphasis on safety or error reporting that coincided with the use of the just culture program. In fact, Baines (2008) attributed increased reporting to the belief that the just culture principles would be followed and that punitive action would be considered within the just culture policy, but also suggested that unrelated factors had an impact, such as a better understanding of reporting requirements through training, more effective investigations and dissemination of findings, and increased belief that reporting will make a difference in improving safety. Additionally, it could be that any transitions away from a punitive- to systems-focused mindset had the effect of improving reporting, and that a blameless culture would have the same benefit as the just culture strategies.

Associations between trust and justice and error reporting are less common. Tangirala and Ramanujam (2008) investigated the cross-level effects of procedural justice on employee's silence by surveying 606 nurses. The research concluded that justice moderated the effects of employee's silence such that silence increased when justice was low. Additionally, organizational trust increased intention to use error reporting system in a sample of healthcare professionals in Japan (Wu et al., 2008).

Safety compliance. The current study hypothesizes as well that (a) just culture will be associated with increased safety compliance compared to punitive or blameless culture (Hypothesis 5); and that (b) the relationship between error management and compliance is mediated by perceptions of justice and trust (Hypothesis 8). Ultimately, just culture error management claims to improve safety and reduce error rates via increases in accountability and commitment for safety behaviors among staff, including compliance

to safety policies, procedures, and processes. It is expected that fair punishments and rewards associated with just culture will maintain appropriate accountability for safe behaviors; whereas blameless error management provides immunity for unsafe practices and encourages risk-taking.

The relation between just culture and safety compliance can be explained via the social exchange and equity theories. First, SET articulates that organizational behavior towards employees will return like behavior. For instance, positive (fair and just) treatment towards employees should encourage positive organizational-referent work behaviors. Organizational researchers have consistently found the dimensions of justice to be related to employee work-related behaviors (Colquitt et al., 2001), including measures of job and task performance (Masterson et al., 2000). Ambrose et al. (2007) argued that distributive justice affects attitudes about specific events (e.g., satisfaction with error management response), whereas procedural justice and interactional justice affect attitudes about the system (e.g., organizational commitment, trust in authorities, etc.). As a result, it is expected that just environments result in greater employee satisfaction and subsequently better performance in their duties as specified in their job descriptions. Furthermore, organizational cultures that support fair and trustworthy treatment towards employees will also encourage and reward trustworthy behavior more broadly (Firth-Cozens, 2003). In addition, the impact of organizational justice perceptions on performance may stem from Equity Theory; when people perceive injustice they seek to restore justice. One way employees can restore justice is by altering their level of performance. As a result, justice perceptions will improve performance

(Karriker & Williams, 2009). In sum, just culture should reduce decision-based and blameworthy noncompliance, and increase efforts to perform safely.

Evidence supports the SET and Equity hypotheses. Ball et al. (1994) surveyed supervisors and their disciplined subordinates about specific punishment events. Punishments perceived as “harsh” were associated with the supervisors’ perception of the subordinates’ subsequent task performance. Although harshness is an imperfect corollary for fairness, these findings suggest that unfair punishments can affect subsequent task performance, such as safety compliance. Aryee et al. (2002) found that equitable exchange relationships between managers and employees motivate employees to act in accordance to organizational norms that emphasize service quality. In a study of 507 hospital nurses, Brooks and Zeitz (1999) found total quality management (TQM) dimensions were related to perceptions of procedural justice. Presently, no evidence exists linking any error management strategy to improved safety compliance behaviors. However, the extent to which just culture error management fosters a sense that punishments are not unduly harsh, and that procedural justice governs decision-making, and encourages equitable exchange interactions between employees and managers; one might expect such a relationship to exist.

Work-related attitudes. The current study additionally hypothesizes that (a) just culture will be associated with increased organizational attraction and organizational commitment compared to punitive or blameless culture (Hypothesis 3, 4, respectively); and that (b) the relationship between error management and these organizational attitudes is mediated by perceptions of justice and trust (Hypothesis 7). Positive work-related attitudes, such as organizational commitment and organizational attraction, are important

antecedents to job performance and organizational effectiveness (Riketta, 2002). When employees feel positively about their organization and their work, they are more motivated on the job and willing to expend additional efforts to get their job done. In addition, attraction to the organization predicts improved rates of recruitment, retention, and voluntary turnover; all of which have significant impact on an organization's bottom line.

As was described previously, SET argues that pro-social organizational behavior towards employees will produce increased subsequent obligations for pro-social employee behavior and feelings toward the organization. For instance, organizational researchers have consistently found the three dimensions of organizational justice to be related to employee work-related attitudes (Ambrose et al., 2007; Colquitt et al., 2001). Several studies have suggested that unfair procedures lead to lowered commitment in employees (Bakhshi et al., 2009; Brooks & Zeitz, 1999; de Cremer, 2005; Masterson et al., 2000). A meta-analysis found that justice perceptions were moderate predictors of job-organization attraction (Chapman et al., 2005). Furthermore, Ambrose and Schminke's (2009) analyses revealed that overall justice perceptions fully mediated the relationship between specific justice dimensions (distributive, procedural, and interactional) and employee attitudes of satisfaction and commitment. Such findings comport with Greenberg's (2001) argument that individuals form impressions of justice by making holistic judgments, and that overall sense of organizational fairness may drive employee behaviors. Furthermore, Aryee et al. (2002) found that trust in one's organization partially mediated the relation between justice and the work attitudes of job satisfaction, turnover intention, and organizational commitment. Empirical evidence has linked trust

in one's organization to organizational commitment and intention to remain (Robinson, 1996; Robinson & Morrison, 1995). Although no previous research has specifically examined the relation between just culture and organizational attraction or organizational commitment, the evidence above, albeit somewhat limited, provides some basis for assuming that (to the degree that just culture engenders a sense of justice and trust in the organization), these outcomes can be expected.

The 10 distinct hypotheses are summarized below and with Figures 1 and 2, showing the interrelationships among the proposed hypotheses.

Hypothesis 1: Just culture will be associated with increased perceptions of organizational justice compared to punitive or blameless culture.

Hypothesis 2: Just culture will be associated with increased perceptions of organizational trust compared to punitive or blameless culture.

Hypothesis 3: Just culture will be associated with increased organizational attraction compared to punitive or blameless culture.

Hypothesis 4: Just culture will be associated with increased organizational commitment compared to punitive or blameless culture.

Hypothesis 5: Just culture will be associated with increased safety compliance compared to punitive or blameless culture.

Hypothesis 6: Just culture will be associated with increased error reporting compared to punitive or blameless culture.

Hypothesis 7: The relationship between error management and organizational attitudes (commitment and attraction) is mediated by perceptions of justice and trust.

Hypothesis 8: The relationship between error management and behavioral intentions (safety compliance and error reporting) is mediated by perceptions of justice and trust.

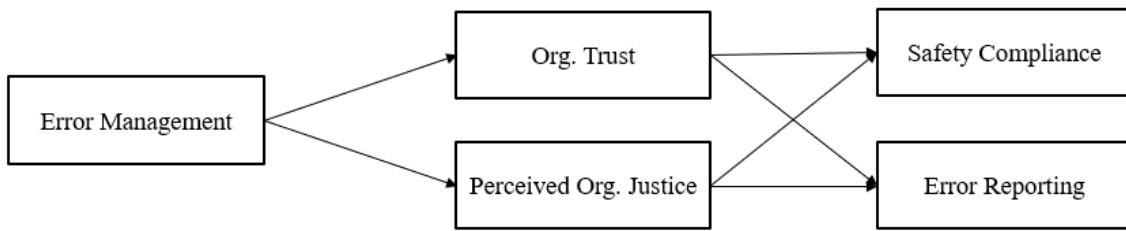


Figure 1. Hypothesized Error Management Path Behavior Intention Path Model

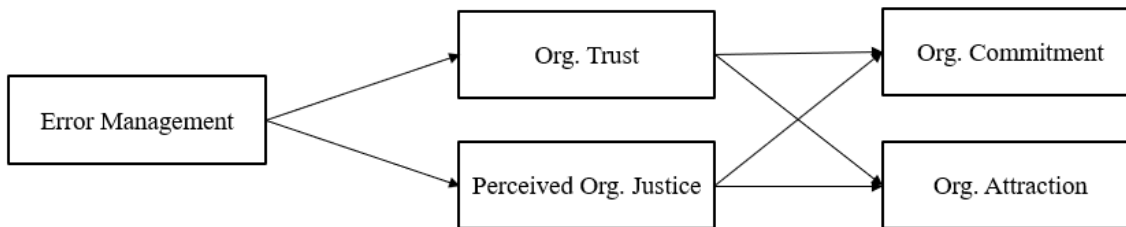


Figure 2. Hypothesized Error Management Path Attitude Path Model

Finally, there may be several demographic and error-specific variables how these error management techniques are perceived and responded to by individuals. For instance, a worker may have worse opinions of organizations generally when the events result in significant patient harm compared to no harm, which may translate to reductions in subsequent perceptions. Similarly, event severity may moderate the association between error management and organizational perceptions. For example, the difference in perceived justice or trustworthiness between punitive and just culture might be reduced under conditions of high event severity likewise, the difference between blameless and just culture may be reduced under conditions of low event severity. Finally, demographic variables such as age, gender, prior experiences with errors (either as a provider or as a patient) or familiarity with concepts of Just Culture and system-based error prevention may shape how individuals interpret and respond to error management strategies. This

study makes no specific hypotheses regarding these relationships, but will examine these variables as covariates on perceptions, attitudes, and behavioral intention outcomes.

Measurement and Implementation of Just Culture

This final section examines the specifics of just culture error management, including an overview of the different types of unsafe behaviors that can lead to errors, a comparison of the most common just culture algorithms, and a description of available mitigation strategies. In practice, *just culture* relies on several techniques in determining what constitutes a fair response in the aftermath of a medical error – error typology, and just culture algorithms.

Error typology. The first technique involves the adoption of a behavior typology system (Marx, 2001), where only some of the unsafe behaviors are determined to warrant disciplinary sanctions. Understanding the error typology guides managers towards effective mitigation strategies. The three types of unsafe behaviors include: *human error*, *at-risk error*, and *reckless error*.

1. *Human error* is said to have occurred when the individual should have done other than what he/she did, and inadvertently caused or could cause an undesirable outcome. Human errors may (a) have to do with limits in human capabilities or range of normal performance variability, or (b) result from external performance-shaping factors. Examples are misreading a label (human variability) when under duress or time pressure (performance-shaping factor) can result in the wrong drug being administered to a patient.
2. *At-risk behavior* (also called, *negligence*) is characterized as conduct that involves a misperception of risk; where the individual drifts into unsafe

habits and does not recognize the level of risk involved or mistakenly believes the risk to be justified. At-risk behaviors are intentional behaviors; often involve short cuts, violations of procedures, and relaxation of compliance to rules or regulations; and are more culpable than human error (Reason, 1997). At-risk behavior also encompasses the legal term “negligent conduct”, which is defined as conduct that “falls below the standard required as normal in the community” (Marx, 2001). In most states, negligence is defined as a failure to exercise the skill, care, and learning expected of a reasonably prudent healthcare provider (Marx, 2001). In essence, negligence refers to conduct that the person *should have been aware* was substantially or unjustifiably risky. It applies to a person who fails to use the reasonable level of skill expected of a person engaged in that particular activity, whether by omitting to do something that a prudent and reasonable person would do in the circumstances or by doing something that no prudent or reasonable person would have done in the circumstances. In general, the just culture approach is not to punish those who engage in at-risk behaviors; rather, the goal is to uncover and remedy the system-based reasons for the behavior and decrease staff tolerance for taking these risks through coaching.

3. *Reckless behavior* (also called, *gross negligence*) involves the knowing and intentional choice to take substantial and unjustified risks. Gross negligence differs from negligent conduct in intent; negligence is the *failure to recognize* a risk that should have been recognized; gross negligence is a *conscious disregard* of a visible, significant risk. Reckless behaviors arise for various

reasons: individuals may personally enjoy risk-taking, desire an adverse outcome for a patient, or believe that the behavior will somehow benefit them or the organization. Recklessness is implicated when individuals make conscious choices to disregard what they know to be considerable risks in favor of one of these personal motivations.

Algorithms. The second technique used is to apply some form of an algorithm to the event. Various just culture algorithms are available; the common ones include Reason's Culpability Decision-Tree (Figure 3), and Hudson's refined Just Culture model (Figure 4), as well as the commercially available Just Culture Algorithm™ (licensed by Outcomes Engineering, LLC. <https://www.outcome-eng.com/>). Common to all algorithms is incorporation of a series of questions used to determine the extent to which individuals *should have known or done* better than to have made the medical error and to what extent the individual should face blame.

Reason's Culpability Decision-Tree (1997) was the initial just culture algorithm available within the patient safety literature. The Culpability Decision-Tree assumes that the actions under scrutiny have contributed to an accident or a serious medical event and acknowledges that a number of different unsafe acts are likely to have contributed to the event (Reason, 1997). As such, the decision-tree should be applied separately to each contributing action. Unlike later algorithms, Reason's decision-tree does not specify particular just culture responses; instead, it describes the degree of culpability one might have for each contributing behavior. Reason's Culpability Decision-Tree includes five lines of questioning:

1. Intended act: The first line of questioning in the decision-tree relates to intention. If both actions and consequences were intended, then it is possibly criminal *reckless behavior*, which is the most culpable of behaviors and deserving of most severe consequences (sometimes, legal).
2. Unauthorized substance: When the action was intended but the consequence was not, the second line of questioning involves the influence of alcohol or drugs known to impair performance at the time that the error was committed. A distinction is made between substances abuse with and without “reasonable” purpose (or mitigation), which, although still reprehensible, is not judged to be as blameworthy as taking drugs for recreational purposes. Unauthorized substance at the time the error was committed is considered a highly culpable act, and may have legal ramifications for the individuals involved.
3. Deliberate violation: The third line of questioning considers whether the behavior was a deliberate violation of the rules, and distinguishes between system-induced violations and those not supported by system factors. If the system promoted or encouraged the violation, the behavior is seen as less culpable than if the individual violated procedures for personal reasons. System-induced violations include violations that had become automatic or part of the “local working practices” or norms.
4. Substitution test: The fourth line of questioning focuses on whether a different person (well-motivated, equally competent, and comparably qualified) would have made the same error under similar circumstances (as determined by their peers). If “yes”, the person who made the error is probably acting in non-culpable

ways, which are viewed as either system-induced behaviors (insufficient training, selection, or lack of experience) or within normal human performance variation (i.e., human errors). If “no”, then negligent behavior should be considered.

5. Repetitive errors: The final line of questioning asks whether the person has committed unsafe acts in the past. This does not necessarily presume culpability, but it may imply that additional training or counseling is required.

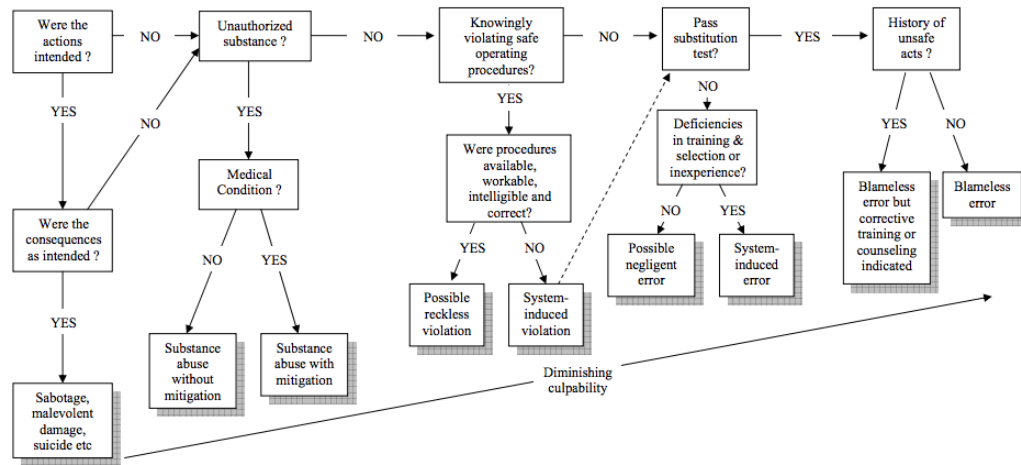


Figure 3. Reason’s Culpability Decision-Tree.

Hudson et al. (2000) expanded and increased the complexity of Reason’s Culpability Decision-Tree by integrating different types of errors and their cause (Hudson’s refined Just Culture Model; Figure 4), and including recommended specific error management strategies or “solutions.” This model (also called “Hearts and Minds”) defines accountabilities at all levels (frontline workforce, manager, and supervision) and categorizes unsafe acts according to the motivation from which they arose (from “normal compliance” to “exceptional violation”). This approach includes the following three types of information to guide those involved in deciding accountability: violation type, job role,

and consequence (either punishment or coaching). Rather than following a line of questions, Hudson requires the administrator to first identify the underlying motivation of the erring healthcare worker. Motivations may include:

1. Normal compliance: Behavior that is in compliance with all procedures and best practices. Not an error.
2. Unintentional violation/awareness/understanding: The error involves actions that were *thought to be* in compliance with procedures and practices. These behaviors are consistent with human errors, as defined by Reason (1997), and result in “no blame for the worker”.
3. Routine violation: The error conforms to the norms and culture of the environment in which the error was performed. These types of system-producing behaviors are generally consistent with Reason’s (1997) definition of at-risk behaviors – where risk is unrecognized due to the norms that permeate the environment. Hudson suggests that routine violations should be met with “active coaching” at all levels of the environment.
4. Situational violation: The error was unavoidable; the procedure cannot be followed if one is to get the job done.
5. Optimizing violation: The violating error was done knowingly, but was thought to benefit the company; risk was unrecognized.
6. Personal optimizing violation: The violating error was done knowingly, but was thought to personally benefit the worker; risk was unrecognized.
7. Reckless personal optimization: The violating error was done knowingly, and risk was known.

8. Exceptional violation: Rare and exceptional errors that the organization may not be prepared to handle or predict.

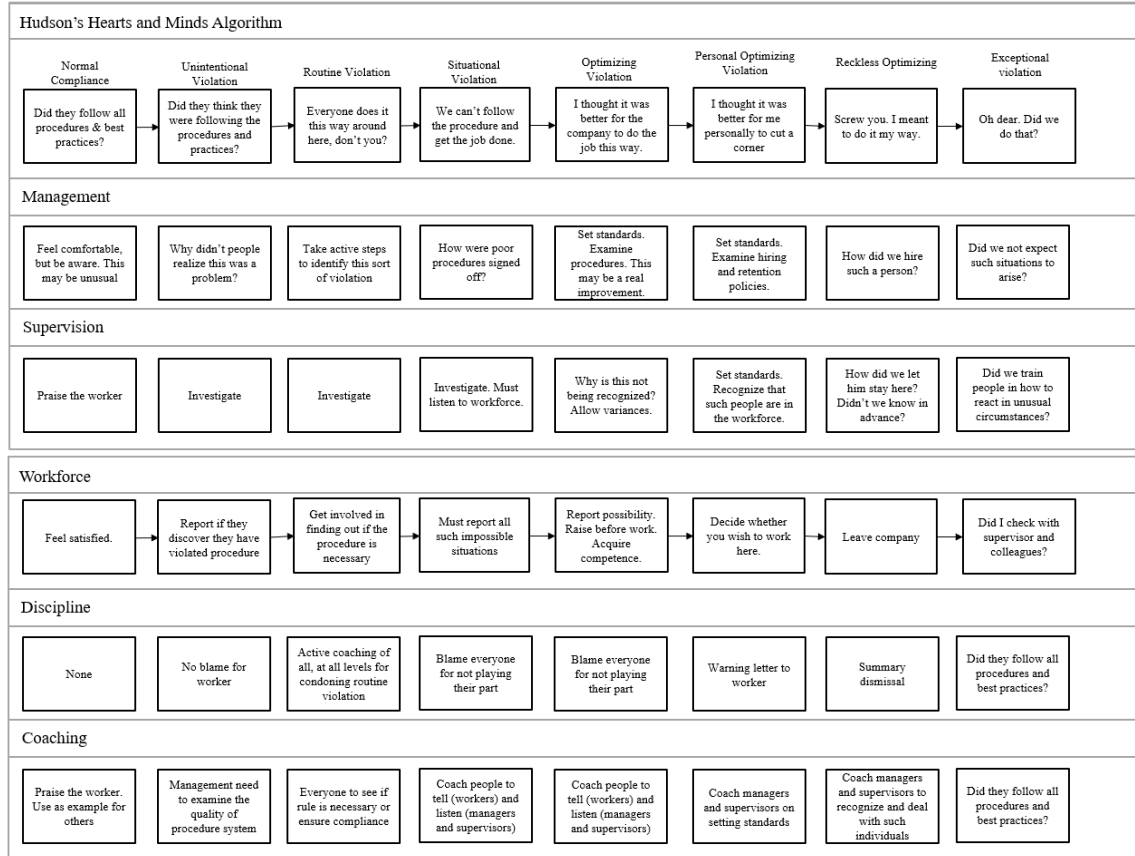


Figure 4. Hudson's Refined Just Culture Model, "Hearts and Minds"

In sum, the application of just culture error management involves recognition of the types of unsafe acts that can contribute to preventable patient harm (human errors, at-risk behaviors, and reckless behaviors), and the application of algorithms to guide hospitals in their error management tactics. Although the various algorithms differ to some degree, there are several underlying truths that guide the development of an appropriate "just" response to errors across all three approaches. First, human errors (or unintentional violations" per Hudson) are least culpable behaviors that should be treated with blameless consolation. Secondly, at-risk errors should be treated with system-

focused solutions and performance shaping strategies (coaching or remedial actions, such as training and education), but not disciplinary actions; until repetitive issues warrant more severe responses. Finally, reckless behaviors, where the risk is known and undertaken anyway, deserve punitive or disciplinary actions.

Chapter 3

Method

Restatement of purpose

This study examined the relation between error management techniques (just, punitive, or blameless strategy), event severity, organizational perceptions (organizational trust and organizational justice), safety-critical behaviors (safety compliance, error reporting), and organizational attitudes (organizational attraction, organizational commitment).

Description of participants

Individuals were recruited from upper-level nursing undergraduate students at a large, urban university. These students were identified for participation because they will have completed 80% of the requisite bachelor-level nursing coursework, including at least one on-the-job training placement with preceptor nurses. Demographic variables, including age, gender, year of degree, familiarity with just culture concept, and experience with medical errors (harmed by medical error, or made an error during care), were collected. The return rate (% of respondents completing the entire survey) was calculated, with a description of non-responders included in the final analysis.

Description of instruments/measurement procedures

Stimulus materials. Two salient components of the vignette served as the study independent variables. The first independent variable – *error management response* – had three levels (punitive, blameless, and just), while the second – *event severity* – had three levels (no harm, harm) as well. These components were combined to yield six separate

vignettes, which each preceded by an at-risk medical error description. This resulted in 6 (3x2) conditions. The components of the vignette appear in Appendix A.

Material development. Vignettes were constructed with the help of personnel (Nursing Administrators, Quality Management and Patient Safety personnel, and Risk Manager) employed at a local research pediatric hospital, based on just culture algorithms in the literature. The error description used in the present study, which was the same across all 9 experimental conditions, was developed based on a single at-risk medical error description modified from Marx (2001). Modifications include the addition of an in-depth description of the healthcare worker's motivations and considerations involved in making the at-risk error, as well as contextual information about the work environment (managerial decisions and focus). The harm description and error management description were developed for the purpose of this study.

To ensure that the three error management approaches were applied appropriately in the vignettes, 5 independent subject matter experts (SMEs) trained in error management were asked to rate each vignette component on the degree to which it matched the three error management approaches, and the degree to which the vignettes were "realistic". All SMEs were experienced healthcare professionals (Nursing Managers, Patient Safety and Risk Managers, etc.) working in a pediatric hospital setting who had completed a training course on the use of error management in a clinical setting by an outside vendor. Fleiss's kappa (Fleiss, 1971) for the vignette materials were above .80, characterized as excellent agreement.

Survey materials. Survey materials measured 6 variables: 1. Organizational justice, 2. Organizational trust, 3. Organizational commitment, 4. Organizational

attractiveness, 5. Safety compliance, and 6. Error reporting. Each is described in detail below. For each measure, the participant was asked to consider the hospital's error management response (actions taken as a result of the safety event as described in the vignette) when completing the survey measure.

1. *Organizational justice.* Organizational justice was measured using the six-item Perceived Overall Justice (POJ) scale developed by Ambrose and Schminke (2009). The POJ scale consists of three items to assess individuals' personal justice experiences and three items to assess perceived organizational fairness. Individuals report their level of agreement with each POJ statement on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Responses are coded such that higher ratings reflect greater perceptions of fairness, with the possible range varying from 6 to 42. Internal reliability for this overall justice scale has been shown to be high, $\alpha = .92$ and $.93$ in two samples (Ambrose & Schminke, 2009).
2. *Organizational trust.* Organizational trust was measured using Robinson and Rousseau's (1994) seven-item Trust scale, designed to assess employee's overall perceptions of trust in the organization as an entity. Individuals report their agreement with each statement on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Responses to the items were recoded such that higher ratings reflect greater degree of trust, with the possible score range varying from 7 to 35. Alphas for this scale were 0.93 (Robinson & Rousseau, 1994), with a test-retest reliability of .88 (Ng & Feldman, 2013).

3. *Organizational commitment.* This construct was measured using the Organizational Commitment Questionnaire (OCQ; Mowday et al., 1979), which was modified somewhat to reflect observations about the hypothetical organization. The OCQ consists of 15 items, of which 6 are negatively poled. Individuals report their agreement with each statement on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Responses to the items are recoded such that higher ratings reflect a greater degree of trust, with the possible range varying from 15 to 75. Internal consistency of the OCQ is high (alpha = .82 - .93). In addition, Lam (1998) reported a retest reliability of .59 over a period of 10 weeks.
4. *Organization attractiveness.* Organizational attractiveness is the degree to which a respondent shows interest in working for an organization. Attraction was measured using Schein and Diamante's (1988) 4-item scale. Participants were asked to rate their level of agreement for each item, on a scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores reflect a greater degree of agreement, with the possible range varying from 4 to 20. Internal consistency of these 4 items is high (Cronbach's alpha = 0.91, 0.92, and 0.93; Schein & Diamante, 1988).
5. *Safety compliance.* The Compliance with Safety Behaviors scale (CSB; Hayes et al., 1998) consists of 11 items that assess how frequently individuals engage in several forms of safe behavior. Item stems were adapted from this scale to highlight the degree of accountability and responsibility individuals feel towards engaging in safety compliance at the hypothetical organization

mentioned in the vignettes (i.e., *As an employee at this organization, I am expected to...*) rather than in general. Responses range from 1 (“never”) to 5 (“always”), with a possible range of scores varying from 1 to 5. After recoding negatively worded items, higher scores reflect greater compliance with safe work behaviors. CSB scores were calculated by averaging the responses. An example item was “Follow all procedures regardless of the situation”. Internal reliability of these items has been reported as moderate (Cronbach = 0.85; Hayes et al., 1998).

6. *Intention to report similar error.* Error reporting intentions were measured using a five item instrument developed by Kim (2005) to assess likelihood for reporting errors. Respondents answer the questions using a 10-point Likert scale ranging from 0 (never) to 10 (always), with possible average scores values ranging from 0-10. An example item is “If I committed an error that had no adverse effect on patients, I would report the error to the organization”. Cronbach’s alpha has been found to be 0.85 (Kim, 2005) and 0.83 (Ko & Yu, 2017).

Description of procedures

Undergraduate subjects were contacted during regular class time and asked to participate in the survey-based study prior to a class presentation. The survey was administered at the beginning of the class time, with participants randomly assigned to one of 6 experimental conditions. Although each participant read and responded to only one of 6 vignettes, all respondents were asked to complete all of the other measures listed above (i.e., demographics and 6 questionnaires). Following completion of the survey, the

Chief Patient Safety Officer from a local pediatric hospital and/or the lead researcher presented a brief lecture on patient safety, as compensation for participation.

Preliminary Analyses

To help ensure that the error described in the vignettes is truly an “at-risk” error as defined in the previous chapter, a pilot study was conducted with 50 working nurses recruited through an online survey tool, SurveyMonkey™. The nurses were asked to read the event description and complete a six-item attribution measure (Hofmann & Stetzer, 1998) using a seven-point Likert rating scale. The six statements concern the contribution a particular cause had on the event described in the vignette, including the individual’s carelessness, time pressure to finish the task more quickly, pressure from management, poor choices on the part of the individual, the situation in general, and the individual in general. Causes are categorized as either internal (relating mainly to the individual) or external (relating mainly to the situation). Respondents rated each statement on a seven-point (1-7) strongly disagree/strongly agree Likert scale, with high scores indicating agreement that a particular cause contributed to the event. Results suggest that both internal items ($M = 4.87$, $SD = 1.4$) and external causes items ($M = 5.59$, $SD = 1.1$) were rated as highly contributing to the event.

Check on randomization to groups. All demographic variables were analyzed to determine if randomization was successful in achieving a balance among the groups. For dichotomous variables, logistical regressions were conducted; for continuous variables, two-way MANOVAs (comparing participants in all 6 experimental conditions) were used to assess for differences between experimental groups.

Manipulation check. Three manipulation check items were created for this research project (Appendix B). Manipulation check items focused on the specific independent variables associated with the study, asking participants to indicate which of several options listed actually occurred within a given vignette. In the first item, participants were asked to identify the error that occurred in the vignette from several options. In the second item, participants were asked to identify what type (if any) harm was experienced by the patient. In the last item, participants were asked to identify whether the nurse, the organization, or both nurse and organization were responsible for the event. Data collected from any participants responding incorrectly (< 100% correct) to these manipulation checks were removed from further analysis. These checks were used to “weed out” participants who did not understand the medical scenario, or who otherwise did not attend to details in the vignette in order to respond in a meaningful way to the experimental condition.

Assessing data assumptions. The data were examined for univariate and multivariate outliers, normality, independence of observations, and linearity between variables. For continuous variables, univariate outliers were considered standardized cases that are outside the absolute value of 3.29 (>3 standard deviations away from the mean on a single variable). Once univariate outliers were removed from the dataset, multivariate outliers were assessed for and removed using Mahalanobis distance. Data was examined for missingness, with greater than 5% missing considered problematic (Schafer, 1999).

Primary analyses

Relations between study variables. Correlational matrices were prepared for all study variables to examine the degree of relatedness between all sets of pairs.

Differences between groups. A 3 (Error Management: Punitive, Blameless, vs. Just) x 2 (Event Severity: No Harm, vs. Severe Harm) Multivariate Analysis of Covariance (MANCOVA) was conducted to examine the differences between conditions across the 6 study dependent variables: organizational justice, organizational trust, safety compliance, error reporting, organizational commitment, and organizational attraction, controlling for study covariates. Follow-up ANOVAS were conducted to analyze further any significant variables, with appropriate post-hoc analyses applied to isolate more precisely the source of the significant findings. For non-normal variables, a series of non-parametric tests were conducted to assess differences across study conditions and covariates. All of these analyses were performed using the latest version of SPSS [version 26].

Mediation Tests. Baron and Kenny (1986) hierarchical regression mediation analyses were first conducted on each outcome variable independently as an initial check on mediation and to identify the relevant covariates to be included in subsequent path models. This approach is designed to supplement more comprehensive modeling and fails to account for potential covariance among outcome variables. Establishing mediation using this approach involves four steps (1): establish there exists an effect that may be mediated by showing a predictor variable is correlated with the outcome; (2) establish the predictor variable is associated with mediator variable(s); (3) establish that the mediator(s) affect the outcome variable; and (4) evaluate for complete mediation,

where the strength of the association between predictor(s) and outcome variable is reduced to zero when controlling for mediator(s). Following this approach, each dependent variable was regressed onto error management conditions (dummy coded categorical variable) and event severity. In a stepwise fashion, the independent variables and covariates were entered into the regression analysis (step one), followed by the mediator variables of organizational justice and organizational trust (step two: added simultaneously). Any covariates that were shown to be significant in the MANCOVA analyses were included in step one. All analyses were performed using SPSS [version 26].

Path analysis. Structural Equation Modelling (SEM or path analysis) is a theory-driven data analytic approach for the evaluation of a priori specified hypotheses about causal relations among measured and/or latent variables. SEM involves model conceptualization, parameter identification and estimation, data-model fit assessment, and potential model re-specification. Ultimately, this process allows for the assessment of fit between correlational data and one or more competing casual theories. Path analysis is a form of SEM, which emphasizes the relationships between the measured study variables, but does not evaluate the reliability of the measurement simultaneously. Path analysis allows one to test direct and indirect effects in a system of regression equations, examine the ability of more than one predictor variable to explain one or more dependent variable; and to fix parameters at certain values to produce parsimonious statistical models. For the present study, path analysis was conducted to evaluate the hypothesized mediating role of perceptions of perceived organizational justice and organizational trust between error management and organizational attraction and organizational commitment,

safety compliance, and error reporting, as well as the direct effect of event severity on these perceptions. All path analysis was conducted in the Mplus (version 8) statistical analytics software.

Model specification. Model specification is the process for identifying what variables are independent variables, dependent variables, mediators, and which parameters will be freed or estimated. Two primary models were pursued in this study; one measuring the impact of error management and event severity on organizational-focused outcomes (organizational commitment and organizational attraction), and the other measuring the impact of error management and event severity on individual-behavioral intention outcomes (safety compliance and error reporting). Using the McArdle-McDonald reticular action modeling (RAM) symbolism for model diagrams (McArdle & McDonald, 1984), every model parameter that required a statistical estimate was represented. In both models, error management and event severity were treated as an exogenous categorical independent variable and were free to vary. Error management was dummy-coded where EM1 = punitive error management, EM2 = blameless error management, and just culture was the reference condition. Endogenous variables have a disturbance which will be estimated in the model and free to covary. A disturbance represents all omitted or unmeasured causes (unexplained variance). A disturbance correlation reflects the assumption that the corresponding endogenous variables share at least one common omitted cause, such as measurement method. All model parameter estimates were tested for statistical significance based on a ratio of the test statistics to standard error using a t- or z-statistic. For statistical significance, the z-test was required to exceed 1.96.

Model identification. The goal of identification is to confirm the specified models are “overidentified”, or a model for which there are more known parameters than free parameters. The following equation was used to calculate the number of parameters that can be estimated with the primary study variables: $Np = p(p+1)/2$, where ‘p’ is the number of observed variables in the model (i.e., 6 variables; 7 total with dummy coding). For the current study, the equation with dummy coding error management is $7(8)/2 = 28$. The addition of any known significant covariates will increase the number of parameters within the model. When comparing nested models, procedure dictates that one first analyzes the “full” model (with the greatest number of parameters), then compares the reduced model to determine the best fitting, most parsimonious solution. All models were over-identified, meaning each contained less than 28 parameters requiring estimation (total sum of all variances, covariances, and direct effects within the path model).

1. Attitudinal Models: Error Management and Event Severity on Attitudinal

outcomes: Using “just culture” error management as a reference group, attitudinal analyses evaluated full and partial mediation models, where justice and trust mediate the relationship between error management and attitudinal outcomes of organizational attraction and organizational commitment, controlling for the direct effect of severity on organizational perceptions. Covariation between endogenous error terms was estimated in both models (i.e., mediator error terms were allowed to covary, as will dependent variable error terms). First, the partial mediation model (Figure 5) was assessed where the direct effects are estimated (free to vary) with the model. Next, a full mediation model was produced; with indirect effects of error management and attitude outcome variables constrained to

zero (nested model, Figure 6). Goodness of fit indices were evaluated for model fit; and the best fitting, most parsimonious model was retained. Finally, multigroup severity analysis was conducted to evaluate whether the relationship between error management and organizational perceptions were equal across event severity conditions.

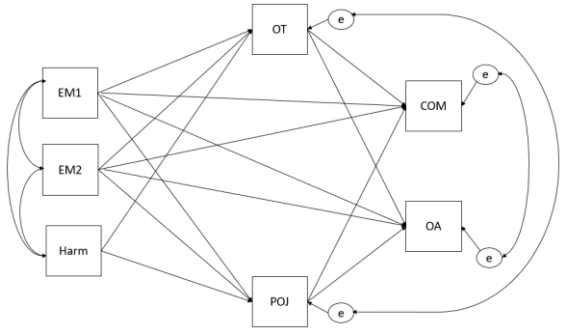


Figure 5. Hypothesized Organization-Focused Attitude Partial Mediation Path Model.

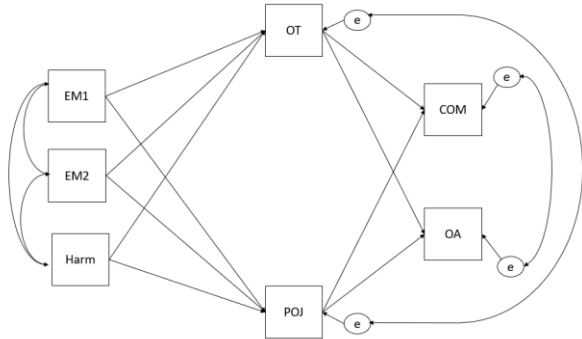


Figure 6. Hypothesized Organization-Focused Attitudes Full Mediation Path Model.

2. Behavioral Intention Models: Error Management and Severity on Behavioral

Intention outcomes: Using “just culture” error management as a reference group, behavioral intention analysis evaluated full and partial mediation model that examined the effects of justice and trust on the relationship between error management and behavioral intention outcomes of safety compliance and error

reporting, and the direct effect of severity on organizational perceptions. All relevant covariates were included for their effect on the outcome variables directly. Covariation between endogenous error terms were estimated in both models (i.e., mediator error terms were allowed to covary, as were dependent variable error terms). First, the partial mediation model was assumed (Figure 7); where the direct effects were estimated with the model. Next, a full mediation model was assessed with indirect effects of error management and attitude outcome variables constrained to zero (nested model). Goodness of fit indices evaluated for model fit; and the best fitting, most parsimonious model was retained.

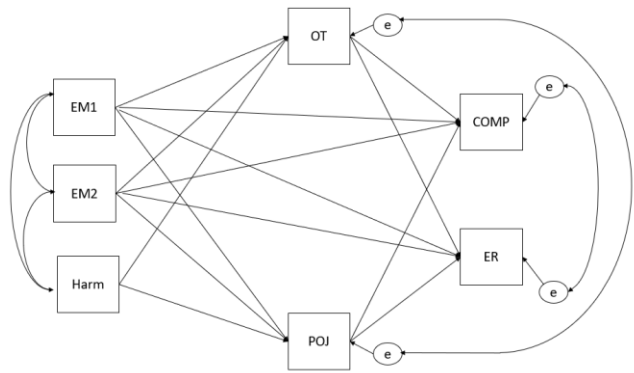


Figure 7. Hypothesized Individual-Focused Behavioral Intention Partial Mediation Path Model.

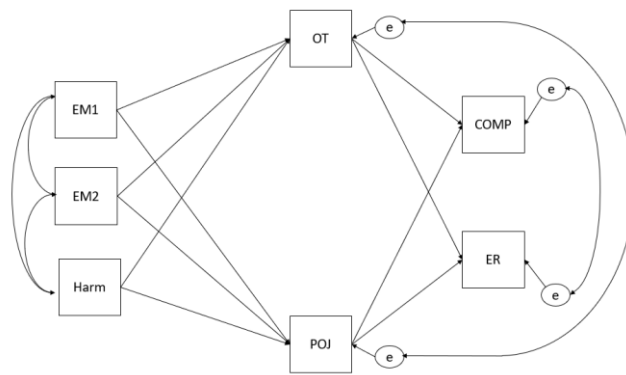


Figure 8. Hypothesized Individual-Focused Behavioral Intention Full Mediation Path Model.

Path Model fit. Model fit was assessed using the chi-square goodness of fit test, comparative fit index (CFI; Bentler, 1990), Tucker-Lewis index (TLI; Tucker & Lewis, 1973), root mean square error of approximation (RMSEA; Hu & Bentler, 1999), and the standardized root mean square residual (SRMR; Hu & Bentler, 1999). The chi-square (χ^2) goodness of fit test assesses the difference between the predicted and sample covariance matrix, or whether the residual matrix is different from zero across each element in the matrix. A non-significant chi-square (χ^2) indicates that the model represents the data. In addition, a number of other model fit indices (e.g., CFI, TLI, RMSEA, SRMR) will be examined and reported. Only RMSEA and χ^2 statistic have distributional properties and can evaluate statistical significance. For CFI and TLI, values range from 0 to 1, and values closer to 1 indicate greater degree that the covariation in the data can be reproduced by the model. Values between .90 and .95 are often considered acceptable model fit. For RMSR and RMSEA, values range from 0 to 1, and values closer to 0 indicate lesser degree of difference between the predicted and observed variances and covariances in the model. Values less than 0.05 is good model fit, 0.05 to 0.08 is an

adequate model fit, 0.08 and 0.10 is a mediocre model fit, and greater than 0.10 is a poor model fit. Chi-square difference tests compared iterative models, and the best-fitting, most parsimonious model was retained.

Moderation effects of event severity. Finally, using cross-group equality constraints, multigroup severity analysis were conducted to evaluate whether the relationship between error management and organizational perceptions were equal across event severity conditions. The fit of the model with parameters constrained to be equal across groups was then compared with that of the unrestricted model without the equality constraints using a chi-square difference (χ^2 difference statistic).

Chapter 4

Results

Two primary models were tested with SPSS and MPLUS in order to address the research questions posed earlier. The first examined the casual relationships between error management and event severity, organizational justice, organizational trust, error reporting, and safety compliance. The second investigated the casual relationships between error management and event severity, organizational justice, organizational trust, organizational commitment, and organizational attraction

The below sections discuss the data collection process, summarize the baseline statistics and demographic characteristics of the sample, and report on the statistical analyses.

Data Collection

A total of 258 upper-level nursing undergraduates were sampled in this study. Four participants were removed from the analysis due to incorrect responses to the manipulation check items, and another 2 participants exhibited a large amount of missing data (greater than 5% of responses). Five participants were removed as univariate or multivariate outliers. As a result, 247 individuals were included in the analysis. Random assignment to groups resulted in 77 (31.2%) participants in the punitive condition, 89 (36.0%) participants in the blameless condition, and 81 (32.7%) participants in the just culture condition. Demographic variables, including age, gender, familiarity with just culture concept, and experience with medical errors (harmed by a medical error, or made an error during care), were collected and summarized in Table 1. The participants ranged

in age from 19 to 52 ($M = 24.5$, $SD = 5.8$); most were female, and had no previous experiences with errors as either patient (92.7%) or provider (81.4%). Familiarity with just culture ranged from 1.00 (not at all) to 5.00 (very familiar) ($M = 1.9$, $SD = 1.2$). Several multivariate logistic regressions were performed to examine whether randomization was effective across conditions for the gender, error as a patient, and error as a provider covariates. Non-significant results suggested that the error management groups were not significantly different on any covariate. Results suggested no difference between error management groups on any of the binomial covariates (Gender: $Wald \chi^2 = .373$, $p = .830$; Error as patient: $Wald \chi^2 = .991$, $p = .082$; Error as provider: $Wald \chi^2 = 2.180$, $p = .091$). Additionally, no difference was found for event severity for any of the binomial covariates (Gender: $Wald \chi^2 = .574$, $p = .082$; Error as patient: $Wald \chi^2 = .911$, $p = .634$; Error as provider: $Wald \chi^2 = .861$, $p = .353$). Two-way *MANOVA* tests were conducted to determine if age differed by groups, indicated no difference in mean age for error management condition [$F(5) = 2.535$, $p = .081$] or event severity [$F(1) = .136$, $p = .712$]. Therefore, randomization to experimental conditions was considered successful.

Table 1
Participant Demographics by Experimental Condition

	Freq.	Percent	Punitive	Blameless	Just Culture	No harm	Harm
Gender							
Females	213	86.2	66	76	71	104	109
Male	29	11.8	8	12	9	12	17
Other	5	2.0	3	1	1	1	3
Total	247	100.0	77	89	81	120	127

Table 1 Continued

	Freq.	Percent	Punitive	Blameless	Just Culture	No harm	Harm
Error as patient							
No	229	92.7	71	81	77	112	118
Yes	18	7.3	6	8	4	8	9
Total	247	100.0					
Error as provider							
No	201	81.4	64	74	68	101	100
Yes	46	18.6	13	15	13	26	20
Total	247	100.0					

Descriptive statistics for all 6 of the study variables are reported in Table 2 below.

Furthermore, in order to assess normality, skewness and kurtosis were calculated for all study variables within condition. All values were within -3 to +3, however, Shapiro-Wilkes tests suggest non-normality of disturbances within each error management condition for safety compliance, error reporting, and organizational attraction (Table 3).

Table 2

Descriptive Statistics of Study Variables

	N	Min	Max	M	SD
Organizational Justice	247	1.00	7.00	4.07	1.39
Organizational Trust	247	1.00	5.00	2.96	.80
Safety Compliance	246	1.64	5.00	4.44	.80
Error Reporting	247	1.00	10.00	8.05	2.08
Commitment	247	1.00	6.87	3.83	1.14
Attraction	247	1.00	5.00	2.57	1.04

Table 3
Descriptive Statistics of Study Variables by Error Management Type

Error Management Type		Min	Max	<i>M</i>	<i>SD</i>	Skew	Kurtosis	Shapiro -Wilkes
Punitive N = 77	Org. Justice	1.00	6.83	3.45	1.39	.086	-.857	.973
	Org. Trust	1.00	5.00	2.79	.83	.267	.312	.979
	Safety Compliance	1.64	5.00	4.38	.88	-1.581	1.353	.732*
	Error Reporting	1.00	10.00	7.89	2.42	-1.035	.132	.837*
	Org. Attraction	1.00	4.75	2.23	.87	.384	-.381	.951*
	Org. Commitment	1.00	5.87	3.35	1.18	-.009	-.810	.982
Blameless N = 89	Org. Justice	1.00	6.83	4.00	1.30	-.086	-.539	.986
	Org. Trust	1.00	4.17	2.80	.71	-.128	-.565	.987
	Safety Compliance	1.91	5.00	4.34	.86	-1.169	.065	.759*
	Error Reporting	2.97	10.00	8.24	1.90	-1.102	.335	.856*
	Org. Attraction	1.00	4.75	2.46	.99	.158	-.932	.945*
	Org. Commitment	1.00	5.87	3.79	.99	-.250	-.094	.995
Just N = 81	Org. Justice	2.17	7.00	4.80	1.15	-.205	-.432	.974
	Org. Trust	2.00	5.00	3.34	.75	.111	-.790	.980
	Safety Compliance	2.91	5.00	4.64	.56	-1.828	2.290	.695*
	Error Reporting	3.00	10.00	8.00	1.88	-.923	.123	.883*
	Org. Attraction	1.00	5.00	3.05	1.11	-.174	-.817	.953*
	Org. Commitment	2.20	6.87	4.37	1.04	.296	-.417	.995

Z-score transformation brought organizational attraction into normality (Punitive: Shapiro-Wilkes = .972, $p = .068$; Blameless: Shapiro-Wilkes = .974, $p = .097$; Just Culture: Shapiro-Wilkes = .968, $p = .062$) and was thus used in subsequent parametric analysis. Analyses involving error reporting and safety compliance, however, were restricted to non-parametric tests, as appropriate.

Bivariate correlations were computed to assess the relationship between the demographic and dependent variables. None of the demographic variables of age, gender, familiarity with Just Culture, error as patient were significantly associated with the primary study variables. Error delivering care as a provider was significantly correlated with error reporting behavioral intention ($r = .160, p = .012$). Table 4 depicts these correlations.

Table 4
Pearson Correlations of Study Variables

		1	2	3	4	5	6	7	8	9	10	11
Organizational Justice (1)	r	1										
	N	247										
Organizational Trust (2)	r	.689	1									
	p	<.001										
Safety Compliance (3)	N	247	247									
	r	.300	.244	1								
Error Reporting (4)	p	<.001	<.001									
	N	246	246	246								
Commitment (5)	r	.107	.039	.316	1							
	p	.093	.538	<.001								
Attraction ^a (6)	N	247	247	246	247	247						
	r	.780	.726	.366	.132	1						
	p	<.001	<.001	<.001	.037							
	N	247	247	246	247	247	247					
	r	.695	.724	.241	.006	.728	1					
	p	<.001	<.001	<.001	.930	<.001						

Table 4 Continued

		1	2	3	4	5	6	7	8	9	10	11
Attraction ^a (6)	N	247	247	246	247	247	247					
	r	.096	.092	-.087	-.082	-.015	.060	1				
Gender (7)	p	.138	.152	.175	.203	.813	.350					
	N	242	244	243	244	244	244	244				
Age (8)	r	.002	.085	-.013	.052	.052	.089	.045	1			
	p	.980	.195	.847	.430	.432	.176	.496				
Familiar with JC (9)	N	233	233	232	233	233	233	231	233			
	r	.065	.071	.002	.121	.091	.082	-.016	.044	1		
Error as patient (10)	p	.309	.264	.975	.057	.155	.197	.799	.505			
	N	247	247	246	247	247	247	244	233	247		
Error delivering care (11)	r	-.088	-.026	-.106	-.097	-.029	.030	-.017	.217	.003	1	
	p	.168	.682	.096	.129	.648	.635	.791	.001	.961		
Error delivering care (11)	N	247	247	246	247	247	247	244	233	247	247	
	r	-.033	-.052	-.094	-.160	-.018	.009	.086	-.067	.192	-.054	1
Error delivering care (11)	p	.611	.416	.142	.012	.782	.891	.181	.310	.002	.397	
	N	247	247	246	247	247	247	244	233	247	247	247

Between-Group Results

Mediation outcomes. A two-way MANCOVA was conducted in order to assess the associations between error management, event severity, and the mediation variables of organizational justice and organizational trust, while controlling for all study covariates. Box's Test was non-significant [Box's $M = 11.649, F = .759, p = .725$] and Levene's statistic was non-significant for both justice [$F(5, 225) = 1.036, p = .397$] and trust [$F(5, 225) = .975, p = .434$]. The MANCOVA procedure was significant for error management conditions management [$F(4, 438) = 7.863, p < .001, \text{Wilks' } \Lambda = .870, \text{partial } \eta^2 = .067$], but not for event severity [$F(2, 219) = 1.221, p < .297, \text{Wilks' } \Lambda = .989, \text{partial } \eta^2 = .011$] or the interaction term [$F(4, 438) = .224, p < .926, \text{Wilks' } \Lambda = .996, \text{partial } \eta^2 = .002$]. In addition, none of the covariates were significant ($ps \geq .321$). These results are depicted in Tables 5. Between-subjects tests indicated significant differences among error management conditions for both organizational justice, $F(2) = 10.971, p > .001$ and organizational trust, $F(2) = 7.196, p = .001$.

Table 5
Multivariate Analysis of Covariance Tests for organizational perception variables^a

Effect	Wilks' Λ	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
EM	.790*	13.69	4	438	<.001	.111
Severity	.987	1.40	2	219	.249	.013
Interaction	.995	0.27	4	438	.995	.003
Age	.995	.560	2	219	.572	.005
Gender	1.00	.000	2	219	1.00	.000

Table 5 Continued

Effect	Wilks' λ	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Familiarity with JC	.994	.698	2	219	.499	.006
Error as patient	.993	.791	2	219	.455	.007
Error as provider	.990	1.143	2	218	.321	.010

a. Design: Intercept + EM + Severity + Interaction + all study covariates

Post-hoc ANOVAs were conducted to isolate the differences across error management conditions for each variable. Just culture was associated with significantly higher scores for both perceptions compared to punitive (OJ: $M_{diff} = .9736, p < .001$; OT: $M_{diff} = .3825, p = .005$) and blameless (OJ: $M_{diff} = .5007, p .043$; OT: $M_{diff} = .4183, p = .002$) error management. All ANOVA results are depicted in Tables 6 below.

Table 6

Post-hoc Analysis of Variance Comparisons for organizational perception variables

DV	(I) Error Management Type	(J) Error Management Type	Mean Diff (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Org. Justice	Punitive	Blameless	-.4729	.20984	.064	-.9678	.0219
		Just	-.9736*	.21460	<.001	-1.4797	-.4675
	Blameless	Punitive	.4729	.20984	.064	-.0219	.9678
		Just	-.5007*	.20705	.043	-.9890	-.0124
	Just	Punitive	.9736*	.21460	<.001	.4675	1.4797
		Blameless	.5007*	.20705	.043	.0124	.9890
Org. Trust	Punitive	Blameless	.0258	.12128	.975	-.2602	.3118
		Just	-.3925*	.12403	.005	-.6850	-.1000
	Blameless	Punitive	-.0258	.12128	.975	-.3118	.2602
		Just	-.4183*	.11967	.002	-.7005	-.1361
	Just	Punitive	.3925*	.12403	.005	.1000	.6850
		Blameless	.4183*	.11967	.002	.1361	.7005

Based on observed means. The error term is Mean Square(Error) = .607.

Attitude outcomes. A two-way MANCOVA was conducted in order to assess the associations between error management, event severity, and the work-attitude outcome variables of organizational attraction and organizational commitment, while controlling for all study covariates. Initial results suggested that the data met the assumptions of MANOVA (Box's M = 8.986, $F(6) = 1.479$, $p = .181$; Levene's statistic for attraction: $F(5, 225) = 1.459$, $p = .235$, and commitment $F(5, 225) = 1.420$, $p = .244$). The MANCOVA procedure was significant for error management conditions management [$F(4, 438) = 6.764$, $p < .001$, Wilks' $\Lambda = .887$, partial $\eta^2 = .058$], but not for event severity [$F(2, 219) = 1.001$, $p < .369$, Wilks' $\Lambda = .991$, partial $\eta^2 = .009$] or the interaction term [$F(4, 438) = 1.566$, $p < .182$, Wilks' $\Lambda = .972$, partial $\eta^2 = .014$]. In addition, none of the covariates were significant ($ps \leq .189$). These results are depicted in Table 7.

Table 7
Multivariate Analysis of Covariance Tests for attitudinal variables^a

Effect	Wilks' Λ	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
EM	.887*	6.764	4	438	<.001	.058
Severity	.991	1.001	2	219	.369	.009
Interaction	.972	1.566	4	438	.182	.014
Age	.995	.580	2	219	.561	.005
Gender	.985	1.681	2	219	.189	.015
Familiarity with JC	.995	.602	2	219	.549	.005

Table 7 Continued

Effect	Wilks' λ	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Error as patient	.995	.549	2	219	.578	.005
Error as provider	.994	.619	2	219	.539	.006

a. Design: Intercept + EM + Severity + Interaction + all study covariates

Between-subjects tests indicated significant differences among error management conditions for both organizational attraction, $F(2) = 7.306, p = .001$, partial $\eta^2 = .062$, and organizational commitment, $F(2) = 12.829, p < .001$, partial $\eta^2 = .104$. Post-hoc ANOVAs were conducted to isolate the differences across error management conditions for each variable. Just culture was associated with significantly higher scores for both organization-focused attitudes compared to both punitive (OA: $M_{diff} = .5684, p = .001$; OC: $M_{diff} = .8334, p < .001$) and blameless (OA: $M_{diff} = .3955, p = .024$; OT=C: $M_{diff} = .4183, p = .036$) error management. All ANOVA results are depicted in Tables 8 below.

Table 8

Post-hoc Analysis of Variance Comparisons for attitudinal variables

DV	(I) Error Management Type	(J) Error Management Type	Mean Diff. (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Org. Attract.	Punitive	Blameless	-.1729	.15209	.492	-.53158	.18576
		Just	-.5684*	.15553	.001	-.93521	-.20162
	Blameless	Punitive	.1729	.15209	.492	-.18576	.53158
		Just	-.3955*	.15006	.024	-.74940	-.04162
	Just	Punitive	.5684*	.15553	.001	.20162	.93521
		Blameless	.3955*	.15006	.024	.04162	.74940

Table 8 Continued

DV	(I) Error Management Type	(J) Error Management Type	Mean Diff. (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Org. Commit	Punitive	Blameless	-.4151*	.17041	.041	-.8170	-.0132
		Just	-.8334*	.17427	<.001	-1.244	-.4224
	Blameless	Punitive	.4151*	.17041	.041	.0132	.8170
		Just	-.4183*	.16814	.036	-.8148	-.0218
	Just	Punitive	.8334*	.17427	<.001	.4224	1.244
		Blameless	.4183*	.16814	.036	.0218	.8148

Based on observed means. The error term is Mean Square(Error) = 1.199 for commitment; .955 for attraction.

*. The mean difference is significant at the .05 level.

Behavioral Intention outcomes. MANCOVA procedures are sensitive to violations of normality distributions in residuals. Under circumstances where the underlying data distribution is known to be non-normal, non-parametric tests (distribution-free) are more robust analytic strategies for examining between-group differences. Therefore, several non-parametric tests were utilized to examine differences in safety compliance and error reporting across error management conditions, event severity, and each of the study covariates. Results suggest that there were no differences in mean rank across error management groups for safety compliance (Kruskal-Wallis = 5.094, $df = 2$, $p = .078$) or error reporting (Kruskal-Wallis = .462, $df = 2$, $p = .794$). No significant differences was found across event severity for either safety compliance ($U = 6939.0$, $p = .219$) or error reporting ($U = 7343.0$, $p = .690$). However, additional tests were run for all study covariates, showing a significant difference in error reporting for participants with previous error experience as a provider ($U = 3697.0$, $p = .032$) and

familiarity with just culture principles (Spearman's $\rho = .117, p = .021$).

Table 9
Non-parametric between-subject tests for safety behavior intentions^a

<i>Dependent Variable</i>	<i>Effect</i>	<i>Test Statistic</i>	<i>Sig.</i>
Safety Compliance	EM	5.094 ^a	.078
	Event Severity	7340.5 ^b	.693
	Age	.094 ^c	.156
	Gender	2671.0 ^b	.251
	Familiarity with JC	.072 ^c	.272
	Error as patient	1601.5 ^b	.120
	Error as provider	4016.5 ^b	.229
Error Reporting	EM	.462 ^a	.794
	Event Severity	-1.270 ^b	.204
	Age	.036 ^c	.118
	Gender	2643.0 ^b	.207
	Familiarity with JC	.117 ^c	.021*
	Error as patient	1623.0 ^b	.133
	Error as provider	3697.0 ^b	.032*

a. Kruskal-Wallis H Test

b. Mann-Whitney U Test

c. Spearman's rho

Mediation Analysis

Following Baron and Kenny's (1986) method for assessing for mediation, each dependent variable was regressed onto error management conditions (dummy coded categorical variable where EM1 = punitive and EM2 = blameless) and event severity. In a stepwise fashion, these independent variables and covariates were entered into the regression analysis (step one), followed by the mediator variables of organizational justice and organizational trust (step two: added simultaneously). Any covariates that were shown to be significant in the MANCOVA analyses were included in step one.

Attitudinal outcomes. Assumption testing was undertaken for regression analysis for both attitudinal variables, which found that both attitudes and commitment were normally distributed, linearly related to predictors, had evidence of independent errors, homoscedasticity, and normally distributed errors. Attraction was regressed onto error management conditions (dummy coded categorical variable) and event severity. In a stepwise fashion, independent variables were entered into the regression analysis, followed by the mediator variables of organizational justice and organizational trust added simultaneously. None of the study covariates were included in the procedure due to the lack of association found in the MANCOVA analysis for organizational attraction. In step one, both error management dummy variables were significantly associated with organizational attraction (p 's $\leq .01$).

Table 10

Regression analysis for error management and severity on organizational attraction

			Estimate	S.E.	p
OA	←-	EM1	-.579	.162	<.001*
OA	<---	EM2	-.405	.156	.010*
OA	<---	Harm	.155	.130	.235

When organizational justice and organizational trust were added to the model in step two, error management variables were no longer significant ($ps \geq .440$), while both organizational justice and organizational trust were significant ($ps < .001$). Thus, this is evidence of complete mediation of the association between error management and organizational attraction by organizational justice and organization trust. Table 11 depicts this information.

Table 11

Regression analysis for error management and event severity on organizational attraction, controlling for perception mediators

			Estimate	S.E.	p
OA	<---	EM1	-.086	.111	.440
OA	<---	EM2	-.020	.105	.850
OA	<---	Harm	.034	.086	.689
OA	<---	OJ	.272	.043	<.001*
OA	<---	OT	.609	.075	<.001*

Organizational commitment was regressed onto error management conditions (dummy coded categorical variable) and event severity. In a stepwise fashion, all

independent variables were entered into the regression analysis, followed by the mediator variables of organizational justice and organizational trust added simultaneously. Study covariates were not included in the procedure due to the lack of association found in the MANCOVA analysis for organizational commitment. In step one, both error management dummy variables were significantly associated with organizational commitment (p 's $\leq .015$).

Table 12
Regression analysis for error management and severity on organizational commitment

			Estimate	S.E.	p
OC	<---	EM1	-.825	.175	<.001*
OC	<---	EM2	-.414	.169	.015*
OC	<---	Harm	.093	.140	.509

Initial results indicated that both punitive and blameless error management conditions were associated with commitment. However, when organizational justice and organizational trust were added to the model, blameless management was no longer significantly associated with commitment ($p = .928$), while both organizational justice and organizational trust were significant (p 's $\leq .001$). Interestingly, beyond the effect of justice and trust, punitive error management was still significantly different from just culture error management in commitment. Thus, this is evidence of complete mediation of the association between blameless error management and organizational commitment by organizational justice and organization trust, and partial mediation of the association between punitive error management and organizational commitment by justice and trust. Table 13 depicts this information.

Table 13

Regression analysis for error management and event severity on organizational commitment, controlling for perception mediators

			Estimate	S.E.	<i>p</i>
OC	<---	EM1	-.226	.108	.037*
OC	<---	EM2	.009	.102	.928
OC	<---	Harm	-.030	.083	.722
OC	<---	OJ	.413	.042	<.001*
OC	<---	OT	.531	.073	<.001*

Behavioral intention outcomes. Due to known non-normality of the behavioral data, statistical curve estimation was undertaken for both safety compliance and error reporting. In both Behavioral intention variables, the linear relationship and exponential function was estimated with greatest goodness of fit (Safety Compliance: $R^2 = .018$ and $.020$, respectively; Error Reporting: $R^2 = .014$ and $.023$, respectively). Additional assumption testing was undertaken for both variables, which found that no violations of independence of errors, homoscedasticity, or normal distribution of errors. Therefore, linear regression was utilized for the regression analyses. The first requirement for testing mediation is to establish a relationship between the predictor(s) and outcome variables. At the first step, blameless error management were associated with a significant decrease in safety compliance compared to just culture; whereas, punitive error management and event severity was unrelated to safety compliance. Given that the behavioral intention variables were not examined using a single MANCOVA, prior analyses had not assessed the effect of study covariates simultaneously. Therefore, study covariates were included

in the regression procedure in step one. A significant association was found between blameless error management (EM2) and safety compliance ($p = .038$).

Table 14
Regression analysis for error management and event severity on safety compliance intentions

			β	<i>S.E.</i>	<i>p</i>
COMP	<---	EM1	-.220	.132	.097
COMP	<---	EM2	-.267	.128	.038*
COMP	<---	Harm	.018	.107	.864
COMP	<---	Gender	-.158	.163	.333
COMP	<---	Age	-.003	.009	.764
COMP	<---	Error as patient	-.196	.207	.346
COMP	<---	Error as provider	-.220	.140	.119
COMP	<---	Familiarity with JC	-.015	.046	.750

When organizational justice and organizational trust were added to the model, justice was associated with significant increase in safety compliance ($p = .008$), but blameless error management was no longer significant ($p = .178$). Thus, this is evidence of complete mediation of the association between difference between blameless and just error management and safety compliance by organizational justice. Table 15 depicts this information.

Table 15

Regression analysis for error management and event severity on safety compliance intentions, controlling for perception mediators

			Estimate	S.E.	P
COMP	<---	EM1	-.058	.133	.605
COMP	<---	EM2	-.172	.127	.178
COMP	<---	Harm	-.007	.104	.931
COMP	<---	Gender	-.235	.158	.139
COMP	<---	Age	-.003	.009	.732
COMP	<---	Error as patient	-.148	.200	.459
COMP	<---	Error as provider	-.160	.136	.239
COMP	<---	Familiarity with JC	-.025	.044	.578
COMP	<---	OJ	.140	.052	.008*
COMP	<---	OT	.061	.089	.539

Error reporting was regressed onto error management conditions (dummy coded categorical variable) and event severity. The first requirement for testing mediation is to establish a relationship between the predictor(s) and outcome variables. In a stepwise fashion, all independent variables were entered into the regression analysis, followed by the mediator variables of organizational justice and organizational trust added simultaneously. Study covariates were included in the procedure due to the associations found in the between-subjects analysis for error reporting. Results indicate no significant association between error management or event severity; but did find significant association between experience with error as a provider ($\beta = -1.122$, $p = .002$) and familiarity with just culture ($\beta = .245$, $p = .034$). However, there was no significant

association between error management and event reporting, thus no relationship to mediate. Table 16 depicts this.

Table 16
Regression analysis for error management and event severity on error reporting intentions

			Estimate	S.E.	<i>p</i>
ER	<---	EM1	-.159	.334	.635
ER	<---	EM2	.047	.323	.884
ER	<---	Harm	.258	.268	.336
ER	<---	Error as provider	-1.122	.350	.002*
ER	<---	Familiar with JC	.245	.115	.034*

Regression analysis were also conducted to examine the associations between all covariates on organizational perceptions (Tables 17). None of the covariates were significant predictors of the organizational perception variables ($p \leq .163$).

Table 17
Regression analysis for covariates on perceived organizational justice and organizational trust

			Estimate	S.E.	<i>p</i>
OJ	<---	Age	-.001	.017	.965
OJ	<---	Gender	-.404	.289	.163
OJ	<---	Familiarity with JC	.091	.080	.255
OJ	<---	Error as provider	-.182	.245	.459
OJ	<---	Error as patient	-.413	.363	.257
OT	<---	Age	.010	.010	.291

Table 17 Continued

			Estimate	S.E.	<i>p</i>
OT	<---	Gender	.208	.167	.214
OT	<---	Familiarity with JC	.051	.046	.271
OT	<---	Error as provider	-.116	.210	.582
OT	<---	Error as patient	-.138	.142	.330

Path Analysis

Path analysis was conducted to evaluate the overall just culture mediation model and confirm specific mediation pathways specified within. Given findings from the MANOVA and regression analyses, all covariates were excluded from the path models for the work-focused attitudinal outcomes; and only error as a provider and familiarity with just culture were included in path models for the individual-focused behavioral intention models.

Attitudinal model. All attitudinal path models were performed using Maximum Likelihood (ML) estimation. Prior to estimation, cross-group equivalency tests were conducted to assess the structural invariance among the primary study variables across all three error management conditions. Results suggest that constrained models did not significantly improve when constraints were removed [χ^2 difference test (8) = 12.913, $p = .11$], indicating a combined sample for the primary study analysis is appropriate. Details of the multi-group analysis are in the Appendix C. Next, event severity and error management (dummy-codes for punitive and blameless approaches) variables were added to the model as exogenous variables. A partial mediation model was examined where the

direct effects of error management were not constrained to zero. Next, a fully mediated work-attitudes path model was performed which constrained the direct paths from error management conditions to outcomes at zero. Model fit was not significantly reduced (i.e., $\chi^2(4) = 7.128, p = .13$), therefore, the more parsimonious fully mediated model was retained. Details of the partial mediation model are reported in Appendix C. Goodness of fit statistics revealed an acceptable model fit for the fully mediated model, [$\chi^2(6) = 7.551, p = .27, CFI = 1.00, TLI = .99, RMSEA = .03, 90\% CI [.00, .09], SRMR = .02$]. Examination of the parameter estimates revealed positive associations between organizational justice and trust with organizational commitment (OJ: $\beta = .438 (.041), p < .001$; OT: $\beta = .512 (.072), p < .001$) and attraction (OJ: $\beta = .276 (.042), p < .001$; OT: $\beta = .619 (.073), p < .001$). Furthermore, negative associations between punitive and blameless conditions and organizational justice (Punitive: $\beta = -.925 (.215), p < .001$; Blameless: $\beta = -.507 (.206), p = .014$) and organizational trust (Punitive: $\beta = -.351 (.123), p = .004$; Blameless: $\beta = -.390 (.118), p = .001$) suggest that each error management condition was associated with significant reductions in perceptions of justice and trustworthiness compared to just culture.

Indirect effects indicate the differences in attraction between punitive and just culture were due to significant paths through both organizational trust ($\beta = -.217 (.081), p = .007$) and justice ($\beta = -.255 (.071), p < .001$). Similarly, the differences in attraction between blameless and just culture was due to significant paths through both organizational trust ($\beta = -.241 (.079), p = .002$) and justice ($\beta = -.140 (.061), p = .021$). The difference in commitment between punitive and just culture was due to significant paths through both organizational trust ($\beta = -.180 (.068), p = .008$) and justice ($\beta = -.405$

(.101), $p < .001$). The difference in commitment between blameless and just culture was due to significant paths through both organizational trust ($\beta = -.200$ (.067), $p = .003$) and justice ($\beta = -.222$ (.092), $p = .016$). No effects were found for event severity on either organizational trust ($\beta = .099$ (.062), $p = .108$) or justice ($\beta = .039$ (.061), $p = .522$).

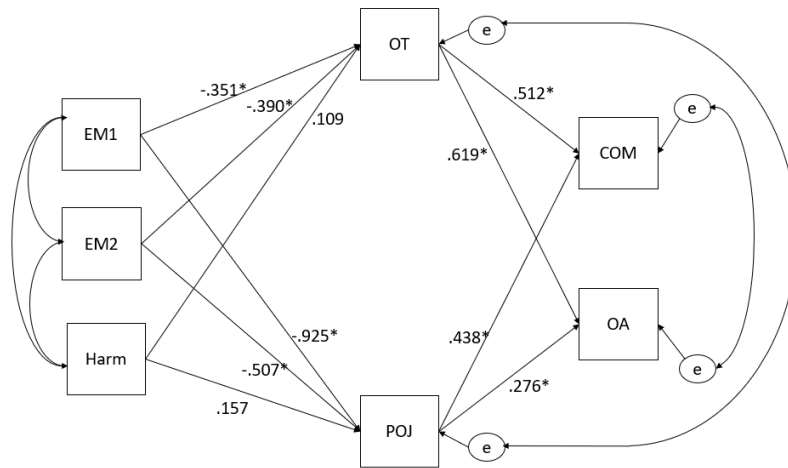


Figure 9. Organizational-Focused Attitudes Full Mediation Path Model

Behavioral intention model. All behavioral intention path models were performed using Maximum Likelihood “Robust” (MLR), which is robust to non-normality and non-independence of observations (provides robust standard errors). First, cross-group equivalency tests were conducted to assess the structural invariance among the perception and behavioral intention variables across all three error management conditions. Results suggest that the model did not significantly improve when cross-group constraints were removed [Satorra-Bentler scaled χ^2 diff (4) = 1.118, $p = .89$], indicating a combined sample for the primary study analysis is appropriate. Details of this analysis can be found in Appendix C.

First, a partial mediation model was examined where the direct effects of error management on behavioral intentions were estimated. Error management (dummy-codes

for punitive and blameless approaches), event severity, and relevant study covariates (familiarity with just culture and error as a provider, due to their significant associations in prior analyses) were added to the model as exogenous variables with direct effects on error reporting, [χ^2 (8) = 7.564, p = .48 (Scaling Correction Factor for MLR=1.0225), CFI = 1.00, TLI = 1.00, RMSEA = .00, 90% CI [.00, .07], SRMR = .03]. Next, the direct effects of error management on behavior intentions were constrained to zero producing a full mediation model with acceptable goodness of fit, [χ^2 (12) = 12.426, p = .41 (Scaling Correction Factor for MLR=1.0081, CFI = 1.00, TLI = 1.00, RMSEA = .01, 90% CI [.00, .07], SRMR = .03]. Model fit did not significantly worsen by including the constraints (Satorra-Bentler scaled χ^2 difference test (4) = 4.77, p = .31). Thus, the more parsimonious fully mediated model was retained. Details of the partial mediation model are in the Appendix C. Examination of the parameter estimates revealed negative associations between punitive and blameless conditions and organizational justice (Punitive: β = -.507 (.203), p = .012; Blameless: β = -.925 (.216), p ≤ .001) and organizational trust (Punitive: β = -.351 (.127), p = .006; Blameless: β = -.390 (.118), p = .001). Organizational justice was positively associated with safety compliance (β = .145 (.060), p = .015) but not error reporting (β = .229 (.144), p = .113). The difference in blameless and just culture error management on safety compliance was due to the indirect effects of organizational justice (β = -.134 (.067), p = .046). No such indirect effects were found for punitive error management (β = -.074 (.045), p = .103). Organizational trust was not associated with either behavioral intention outcome (Compliance: β = .067 (.096), p < .486; Error reporting: β = -.237 (.233), p < .309).

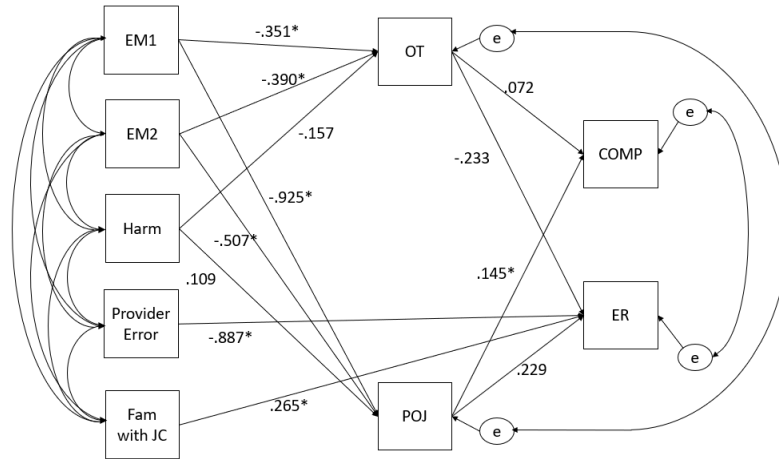


Figure 10. Individual-Focused Full Mediation Path Model

Table 18
Overview of path model fit statistics

	χ^2	<i>df</i>	χ^2 diff	Δdf	RMSEA	CFI	TLI	SRMR
Attitudes								
Partial Mediation	.423	2			.00	1.00	1.00	.01
Full Mediation	7.551	6	7.128	4	.03	1.00	.99	.02
Behaviors								
Partial Mediation	7.564	8			.00	1.00	1.00	.03
Full Mediation	12.426	12	4.89	4	.01	1.00	1.00	.03

Moderation tests. Finally, to test for the moderating effect of event severity, multigroup event severity analyses were conducted constraining the associations between error management and organizational perceptions to be equal. Multigroup analyses are recommended to test for categorical moderation variables (Muthén & Muthén, 2017), where specific parameters are constrained across groups to be equal. The fit of the

complete mediation attitudinal model without parameters constrained did not significantly improve with constraints added [χ^2 diff (4) = 1.142, $p = .89$]. Similarly, the fit of the complete mediation behavior model without parameters constrained was not significantly improved with constraints added [Satorra-Bentler scaled χ^2 diff (4) = 1.118, $p = .89$; Table 19].

Table 19
Overview of multi-group severity fit statistics and model comparison

	χ^2	df	χ^2 diff	Δdf	RMSEA	CFI	TLI	SRMR
Attitudes								
Not constrained	14.492	8			.08	.99	.97	.03
Constrained	15.634	12	1.142	4	.05	1.00	.99	.04
Behaviors								
Not constrained	18.054	20			.00	1.00	1.00	.04
Constrained	19.155	24	4.89	4	.00	1.00	1.00	.04

Furthermore, interaction terms were regressed onto the perceptions (justice and trust): no significant direct effect on either perception (p 's $> .544$), and the interaction terms were significant (p 's $> .453$; Table 20).

Table 20
Regression analysis of error management and event severity interaction terms on organizational perceptions

			Estimate	S.E.	p
OJ	<---	EM1	-1.304	.284	<.001*
OT	<---	EM1	-.525	.167	.002*

Table 20 Continued

			Estimate	S.E.	p
OJ	<---	EM2	-.896	.284	.002*
OT	<---	EM2	-.621	.167	<.001*
OJ	<---	Harm1	.050	.294	.864
OT	<---	Harm1	.105	.173	.544
OJ	<---	Harm_X_EM1	-.086	.410	.833
OT	<---	Harm_X_EM1	-.036	.242	.883
OJ	<---	Harm_X_EM2	.205	.399	.607
OT	<---	Harm_X_EM2	.176	.235	.453

Chapter 5

Discussion

The purpose of this study was to examine the theory of Just Culture, which states that employees will experience optimal organizational and safety-related outcomes under error management circumstances that are perceived as trustworthy and fair. The findings largely provide empirical support for the theory of Just Culture. Just culture error management showed significant increases over other error management methods in perceptions of organizational justice and organizational trust, intention to perform safety compliance behaviors, and work-related attitudes of commitment and attraction. Furthermore, significant evidence of mediation of the primary relationships by organizational justice and/or organizational trust was obtained. Yet, some findings were surprising. Event severity was not found to impact any of the organizational perceptions, attitudes, or safety-critical behaviors directly; nor did event severity moderate the association between error management and organizational perceptions. Additionally, the hypothesis that just culture would improve willingness to engage in error reporting behavior was not supported. In fact, no difference was found in willingness to report errors across all error management approaches. This is an outlier in the known literature on error reporting behavior, and will be discussed in detail in this chapter.

Overall, this study moves the just culture literature forward in several key ways—by examining several underlying (untested) assumptions of the just culture model from an empirical perspective, positioning these assumptions in established organizational theory, and providing support for most of these assumptions through

thorough rigorous analysis. The following section provides a brief summary and interpretation of all study hypotheses and findings.

Perceptions of organizations resulting from error management. The analyses found support for the position that error management strategy impacts how organizations are viewed, globally, in terms of fairness and trustworthiness (Hypothesis 1, 2). As expected, the finding suggests that participants perceived organizations that utilized just culture principles to have higher degrees of fairness (Hypothesis 1) and higher organizational trust (Hypothesis 2) compared to both blameless and punitive approaches. This was true regardless of the severity of the event: for instance, even when the patient was harmed significantly by an error, individuals perceived organizations that utilized harsh punitive measures as being less fair. Similarly, when the patient was not harmed by the error, a completely blameless approach to the individual worker was also seen as unfair compared to just approach. Trustworthiness is, closely linked to displays of justice (Colquitt et al., 2001), and as such, it is not surprising that these relationships covary. Likewise, the strengths of these relationships did not differ by event severity: punitive or blameless responses to both severe and not severe events were seen as less trustworthy than just culture responses. Participant demographics, error experiences, and familiarity with just culture had no effect on the overall perceptions of justice and trust.

The patterns that emerged within the organizational perceptions are of interest, though not directly implicated by the hypotheses. For instance, perceptions of organizational justice and trust did not differ in punitive compared to blameless error management, suggesting that participants found both punitive and blameless error management to be similarly “unjust” compared to just culture. Punitive and blameless

error management can be considered opposites in many ways; however, both approaches share an inflexible reaction to errors that differentiate them from just culture (where a flexible response to errors is a central feature). Inflexibility, and the inability to take event details into account in the application of interventions would unsurprisingly yield unfair results and associated perceptions of unfairness. In the case of blameless error management, the inflexibility is wielded in such a way as to benefit the individual worker who committed the error; the focus is instead on the system. Punitive error management, however, inflexibly punishes the individual within the system and ignores the impact of the system. Although these findings suggest that either approach – whether it benefits the individual or not – is seen as significantly less fair or trustworthy to a flexible response, the difference between punitive and blameless error management trended towards significance ($p = .064$) such that punitive error management may pose a greater violation of sense of fairness.

Similarly, organizational trust did not differ between punitive and blameless error management (both were significantly reduced compared to just culture). However, unlike with organization justice, the differences between the just culture and other error management approaches were much more conclusive. Taken together, these findings suggest that blameless error management “took a hit” when it came to trustworthiness, despite faring better in perceived organizational justice. Although these two variables tend to covary, some research suggests that trust is also derived from perceptions of overall safety (Gunningham & Sinclair, 2008). It may be that in systems that utilize either punitive or blameless approaches, a sense that the real root causes of errors will go uncorrected may further deteriorate trust by undermining the sense that overall safety is

prioritized or competently managed. Overall, Hypotheses 1 and 2 were strongly supported by this research.

Attitudes about the organization resulting from error management. The analyses found support for the proposition that error management strategies impact how individuals feel, globally, towards organizations in terms of attraction and commitment (Hypothesis 3, 4); and that these feelings are driven (at least in part) by perceptions of justice and trust (Hypothesis 7). Event severity, participant demographics, error experiences, and familiarity with just culture had no effect on feelings of attraction and commitment participants reported. Analyses also revealed that, after controlling for justice and trust, a significant difference in organizational commitment between just culture and punitive error management remained. This suggests that employees feel less committed to punitive hospitals for reasons beyond their justice and trust perceptions. These findings strongly support the robust literature findings associated with positive psychosocial outcomes for organizational justice and trust, and provide empirical evidence in support of the proposition that an error management approach may influence those perceptions.

Several interesting patterns emerged within the organizational attitude findings, though not directly implicated by study hypotheses. For instance, punitive and blameless hospitals were similarly viewed as unattractive workplaces, but punitive hospitals engendered significantly lower feelings of commitment compared to blameless hospitals. At first, it may be surprising that blameless hospitals were not considered attractive workplaces to participants, given the willingness of blameless organizations to withhold punishments for an individual's safety errors. In fact, SET argues that pro-social

organizational behavior towards employees will result in reciprocal pro-social feelings and behaviors towards the organization. However, these findings suggest some skepticism is warranted to the concept that a lack of punishment *in all cases* is, in fact, pro-social; and that rather, sometimes punishment may be warranted. Although blameless error management is seen as a “low risk” to an individual for receiving punishment, our findings show that the reduction in the sense of justice and trust that accompany blameless error management accounts for the drop in attraction towards blameless organizations. Stated differently, blameless error management is not pro-social in the ways that matter for workplace attraction; as it fails to indicate fairness and trustworthiness.

Although punitive and blameless hospitals were not different on organizational attraction, punitive error management did inspire significantly less commitment than blameless error management (which was also, significantly lower in commitment than just culture). Low levels of commitment towards blameless and punitive hospitals suggest that these error management approaches are not seen as net positives for the individual. Whereas the reduction in blameless error management compared to just culture was due entirely to reduced justice and trust perceptions; even after accounting for justice and trust, punitive management was still significantly lower in commitment than just culture. This additional low level of commitment may be in retaliation for the low levels of commitment the organization expresses towards the individual worker through a discipline-focused approach to safety. Overall, Hypotheses 5, 6, and 7 were supported by this research.

Safety-critical behaviors resulting from error management. The analyses found partial support for the proposition that error management strategies impact willingness to engage in the safety-critical behaviors of safety compliance and error reporting (Hypothesis 5, 6), and that differences in behavioral intentions were the result of organizational perceptions (Hypothesis 8). Specifically, intention to engage in safety compliance increased in just culture compared to blameless culture, and this increase was the result of perceptions of organizational justice. No differences were found between just culture and punitive culture in terms of safety compliance; or between any error management condition in terms of error reporting. Overall, participant demographics, error experiences, and familiarity with just culture had no effect on willingness to engage in safety compliance behaviors. However, prior experience with errors as a provider and familiarity with just culture were significantly associated with error reporting.

Several findings were surprising. First, participants were equally likely to engage in safety compliance behaviors in punitive and just culture hospitals and were least likely to do so in a blameless hospital. The difference between blameless and just culture was driven entirely by perceptions of justice, suggesting that the lack of justice associated with blameless error management reduces the sense of accountability individuals perceive for safety compliance behaviors. Proponents of the punitive approach to error management have long suggested that accountability is critical for safety; and this assertion is supported by the current study. However, it is important to note that just culture – which purposefully balances personal accountability with system accountability – did not differ from a purely punitive approach. Stated differently: an organization appears not to lose anything with respect to an individual's sense of accountability towards safety

behaviors when going from punitive to just culture. This is an important finding, as it suggests that the main benefit of punitive error management (increased accountability) can be accomplished via Just Culture, but without the myriad of negative outcomes that result from this disciplinary approach.

Perhaps the most surprising finding is that error reporting behavior was unrelated to error management condition, especially given the real-world correlational (non-empirical) studies showing improvements in error reporting following just culture interventions. Several reasons may account for this unexpected result. One interpretation is that error management truly has no impact on error reporting behaviors, as described above. Although several correlational studies have found that the implementation of just culture is associated with improved error reporting rates, it is not possible to identify the exact cause of this ensuing increase. Correlational studies are often unable to distinguish spurious associations from true relationships; for instance, perhaps increases in error reporting is the result of unstudied factors (periods of time of higher patient acuity, reduced nursing staffing, process or procedural changes, etc.) that periodically impacts medical fields and disrupt otherwise stable conditions. In the current study, results suggested that familiarity with just culture concepts may be a confounding (unaccounted for) variable that explains increases in error reporting. For instance, a large-scale implementation of just culture error management likely increases familiarity with the concepts of just culture among staff, especially as staff members come into contact with the new error management procedures. Subsequent increases in error reporting may be credited to the just culture error management techniques, but, according to these results, may be explained (at least partially) by this familiarity instead.

Another interpretation for the lack of relationship between error reporting and error management may be that the design of the current study masked a relationship that was, in fact, actually present. In this study, willingness to engage in error reporting was measured through self-report, and participants indicated a strong bias to report their patient safety errors across all conditions. Reliance on self-report may introduce social desirability bias (Edwards, 1957), where participants report behaviors that they believe are expected or may be desired by the researcher. Nursing students are likely to perceive error reporting as socially desirable behavior, and may even be primed by the patient event vignette to consider the importance of identifying opportunities for errors through robust reporting. Of note, safety compliance intention was also assessed via self-report and was also implicated within the error vignette (the nurse failed to follow a required procedure).

Perhaps a more likely issue is that the sample of nursing students may not have had enough professional experience to accurately assess their error reporting behavior intention under hypothetical scenarios. A significant proportion of the study sample (81.4%) had yet to experience an error while providing care, and therefore, likely did not have any personal experience reporting a patient safety error in a professional context. As a result, it may be difficult to truly understand the psychological trauma that can result from errors, as well as the professional anxiety that may arise when contemplating the choice to voluntarily report. Considering their lack of experience with error reporting, it may be that the study sample was ill-equipped to accurately assess their reporting intentions under various error management scenarios. Without some personal experience as a reference point from which to judge their baseline likelihood towards error reporting,

it is possible that self-serving biases were activated with the survey questions wherein students adopted overly “rosy” expectations for their future professional behavior. On the other hand, the study did find significant variation among safety compliance outcomes across error management conditions. Unlike error reporting, most students will have had some degree of experience with safety compliance-related tasks (following a procedure, for instance) in their practicums and therefore, have a personal baseline reference from which to adjust their intentions given the hypothetical scenarios presented within this study. Overall, this somewhat surprising finding points out the need to more fully explore the associations between error management and error reporting in future investigations; an experimental design that does not rely on a self-report measure is suggested, but rather actively tracks error reporting behavior in samples exposed to just culture error management and attempts to comprehensively control for other possible extraneous factors.

Control variables. Several control variables were analyzed in this study, including demographics (gender, age), prior experiences with errors (as a patient or provider), and familiarity with just culture, and event severity. Control variables were not found to have significant associations with perceptions of justice or trust, organizational attraction, organizational commitment, or willingness to engage in safety compliance. Furthermore, organizational perceptions were not influenced by event severity condition either directly, or through moderation effects. Such results suggest that there is an intuitive fairness and trustworthiness associated with just culture error management: it was apparent for naïve as well as familiar students, was not impacted by previous experiences with errors, had broad support across all ages and genders; and was not diminished by patient outcomes.

For organizations implementing just culture principles, these findings suggest that communication about and implementation of just culture does not have to be nuanced for different groups and can be broadly applicable for many types of providers. Furthermore, workers of all types are likely to have similar perceptions of just, blameless, and punitive error management. However, the significant differences for intentions for error reporting behavior across those with previous errors as providers do pose some problems for organizations. Participants in this study were students; and it appears that some have already internalized a negative association with error reporting following an incident as a healthcare provider. Involvement in an error as a provider can be both personally and professionally traumatic. Whether this reluctance to report is a direct result of being involved in an event itself or due to some a negative outcome the nurse experienced after his or her error is unclear. This finding highlights the importance of providing some level of coaching and support to all error reporters to help them gain a sense of the important value of reporting errors as a safety-improvement effort.

Future directions

This study adds significantly to the nascent literature on error management in healthcare settings. Although the results of this study provide solid empirical support for several just culture hypotheses, some inherent limitations should be acknowledged. For many reasons, it was impractical to examine how workers respond to error management using an empirical between-subjects methodology in a real-world hospital setting. As a proxy, vignettes were used to simulate a work-environment and participants were asked to project their perceptions, attitudes, and behavioral choices into that simulation. Naturally, this proxy is not exact and raises some concerns with respect to validity.

However, having students read vignettes in this way allows tighter control of the experimental conditions that otherwise would be contaminated with measurement error and confounding variables. Projecting onto a simulation forces participants to respond to the details of the simulation *itself*. In contrast, asking participants to rate their actual commitment to their actual organization is likely to be contaminated by extraneous variables of little interest to the current project (i.e., relationship with their colleagues, pay equity, benefits, biases, etc.). Further, asking participants to quantify the degree of just culture expressed at their organization (rather than tightly controlling these conditions through vignettes) would likely have failed to answer a key question of this research: *is just culture perceived as just?* However, based on the current findings, a next logical step would be to extend this theoretical model into an actual work environment by replicating this work using a sample of working nurses, or by surveying working nurses following their involvement with error management interventions. Such studies could also assess associations between perceptions of error management and additional outcomes of interest, such as voluntary turnover and safety citizenship behaviors.

Nursing students were targeted for this research study due to their content and context knowledge of the circumstances described within the event vignettes, as well as their lack of allegiance to a specific organization and likely interest in pursuing a healthcare work environment in the future. However, such methodological choices do not come without their disadvantages. The findings of this study may not be generalizable to student nurses at other universities or to working nurses. Importantly, only students who had some work-like practicum experience were chosen for the study. These experiences were important for two reasons: (1) first-hand knowledge about how nursing work is

truly done and the circumstances that lead to unintentional error was vital to the relevance of the vignette, and (2) each student has been shaped by unique experiences outside of their nursing program, creating a more diverse sample population. As a result, findings from this study likely have greater generalizability than would a study that focused on lesser experienced students.

Future studies may further extend these findings by applying this experimental vignette approach to other types of errors. The current study examined an at-risk behavior involving a failure to follow a procedural rule – because it most forcefully and straightforwardly distinguished between the three error management strategies. Although choosing a single at-risk event was appropriate and necessary for the current study, it is possible that other scenarios might have elicited different responses from participants. For instance, the just culture algorithms specify handling of repetitive errors by evaluating the presence of system and personal performance shaping factors in dichotomous terms (i.e., these factors either are or are not present). However, in most real-world applications, it is likely that both system and personal factors will be present to some degree. From an application perspective, this raises certain questions such as: how weak can these factors be before they can be discounted in the error management response and still retain a sense of fairness and equity? Furthermore, are their specific types of system performance shaping factors (for instance, organizational safety culture) that are perceived to be less relevant compared to others (managerial priorities and decisions, or poor system design) when forming a fair response to errors. These questions, and more, are the realm of future studies.

Finally, the degree to which any vignette is truly representative of any error management strategy may be debated. In this case, subject matter experts provided guidance in the development of the vignettes and rated their acceptability as an illustration of each error management strategy. However, other experts, not consulted for this study, may find objections to some components of the vignette language or content. Future studies may abandon the vignette-based approach for this reason, or may extend and replicate these findings with different true to life error management examples.

Conclusions

For organizations implementing error management techniques, these findings suggest that the most important consideration is the dutifulness to which justice and trustworthiness are maintained towards individuals in the aftermath of event involvement. If providers experience the application of error management to be fair and trustworthy, they are more likely to behave safely and feel attracted and committed to the organization. Importantly, this study also suggests that some allegiance to the just culture algorithms readily available in the literature will likely serve the organization well in terms of justice and trust perceptions. A flexible approach that considers influential systemic factors while reinforcing performance expectations appears to be the best way to elicit perceptions of fairness and trustworthiness. Error management that ignores performance expectations reduces organizational attraction and safety compliance intentions; whereas, error management that fails to consider systemic factors decreases organizational attraction and commitment.

This study moves the just culture literature forward in several key ways: by examining several underlying (previously untested) assumptions of the just culture model from an empirical perspective, positioning these assumptions in established organizational theory, and submitting support for most of these assumptions through thorough analysis. The findings of this study provide empirical support for just culture mediation model, highlighting the importance of organizational trust and perceived organizational justice in fully mediating the association between error management and psychosocial and behavioral intention outcomes. This analysis models associations from explicitly stated organizational responses to specific safety events to explain variance among individuals in terms of these key psychosocial and behavioral intention outcomes. Furthermore, this study was able to reject personal demographics of age and gender, prior experiences with errors as a patient or provider, and familiarity with just culture construct as predictors in how individuals perceive or react to error management practices in terms of attraction, commitment, and safety compliance intention. Finally, this study did not find support for the proposition that error reporting increased under just culture error management. Rather, results suggested that familiarity with just culture concepts may (partially) account for real-world positive associations between just culture implementation and error reporting.

References

- Adams, J.S. (1965). Inequity in social exchange. *Advances in Experimental Social Psychology*, 2, 267-299.
- Allen, N.J., & Meyer, J.P. (1990). The measurement and antecedents of affective, continuance and normative commitment to the organization. *Journal of Occupational Psychology*, 63(1), 1-18.
- Andel, C., Davidow, S.L., Hollander, M., & Moreno, D.A. (2012). The economics of health care quality and medical errors. *Journal of Health Care Finance*, 39(1), 39-50.
- Ambrose, M., Hess, R., & Ganesan, S. (2007). The relationship between justice and attitudes: An examination of justice effects on event and system-related attitudes. *Organizational Behavior and Human Decision Processes*, 103(1), 21-36.
- Ambrose, M. L. & Schminke, M. (2009). The role of overall justice judgments in organizational justice research: A test of mediation. *Journal of Applied Psychology*, 94(2), 491.
- Aryee, S., Budhwar, P.S., & Chen, Z.X. (2002). Trust as a mediator of the relationship between organizational justice and work outcomes: Test of a social exchange model. *Journal of Organizational Behavior*, 23(3), 267-285.
- Ayim Gyekye, S. (2005). Workers' perceptions of workplace safety and job satisfaction. *International Journal of Occupational Safety and Ergonomics*, 11(3), 291-302.

- Barling, J., Kelloway, K., & Iverson, R.D. (2003). High-quality work, job satisfaction, and occupational injuries. *Journal of Applied Psychology, 88*(2), 276.
- Barnsteiner, J. & Disch, J. (2017). Creating a fair and just culture in schools of nursing. *American Journal of Nursing, 117*(11), 58-64.
- Battard, J. (2017). Nonpunitive response to errors fosters a just culture. *Nursing Management, 48*(1), 53-55.
- Bhatnagar, K., & Srivastava, K (2012). Job satisfaction in health-care organizations. *Industrial Psychiatry Journal, 21*(1), 75-78.
- Bleich, S. (2005). Medical errors: five years after the IOM report. *Issue Brief, 830*, 1-15.
- Brown, J. (2010). Hospital tech who spread hep C during drug thefts gets thirty years. The Denver Post. Retrieved from <https://www.denverpost.com/2010/02/24/hospital-tech-who-spread-hep-c-via-drug-thefts-gets-30-years/>
- Baines K. (2008) Just culture: From aspiration to reality. Baines Simmons Limited, [Internet] 2008. [date accessed: 25 July 2011]. Available from: <http://www.raes-hfg.com/reports/21may09-Potential/21may09-baines.pdf>
- Ball, G.A., Trevino, L.K., & Sims, H.P. (1994). Just and unjust punishment: Influences on subordinate performance and citizenship. *Academy of Management Journal, 37*(2), 299-322.
- Bakhshi, A., Kuldeep, K., & Ekta, R. (2009). Organizational justice perceptions as predictor of job satisfaction and organizational commitment. *International Journal of Business and Management, 4*(10), 5539.

- Baron, R.M. & Kenny, D.A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182.
- Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238-246.
- Bies, R.J., & Moag, J.F. (1986). Interactional justice: Communication criteria of fairness. In R.J. Lewicki, B.H. Sheppard, & M.H. Bazerman (Eds.). *Research on Negotiations in Organizations* (vol 1). JAI Press, Greenwich.
- Brooks, A. & Zeitz, G. (1999). The effects of total quality management and perceived justice on organizational commitment of hospital nursing staff. *Journal of Quality Management*, 4(1), 69-93.
- Burns, C., Mearns, K., & McGeorge, P. (2006). Explicit and implicit trust within safety culture. *Risk Analysis*, 26(5), 1139-1150.
- Butler, S. (2015). The just culture, second victimization, and clinical support: An educational/awareness program. *Doctor of Nursing Practice (DNP) Projects*, 49. Retrieved from https://scholarworks.umass.edu/nursing_dnp_capstone/49
- Carnevale, D.G., & Wechsler, B. (1992). Trust in the public sector: Individual and organizational determinants. *Administration & Society*, 23(4), 471-494.
- Chapman, D.S., Uggerslev, K.L., Carroll, S.A., Piasentin, K.A., & Jones, D.A. (2005). Applicant attraction to organizations and job choice: A meta-analytic review of the correlates of recruiting outcomes. *Journal of Applied Psychology*, 90(5), 928-944.

- Clark, M.C. & Payne, R.L. (1997). The nature and structure of workers' trust in management. *Journal of Organizational Behavior*, 18(3), 205-224.
- Colquitt, J.A., Conlon, D.E., Wesson, M.J., Porter, C., & Ng, K.Y. (2001). Justice at the millennium: A meta-analytic review of 25 years of organizational justice research. *Journal of Applied Psychology*, 86(3), 425-445.
- Colquitt, J.A., Scott, B.A., & LePine, J.A. (2007). Trust, trustworthiness, and trust propensity: A meta-analytic test of their unique relationships with risk taking and job performance. *Journal of Applied Psychology*, 92(4), 909-927.
- Connor, M., Duncombe, D., Barclay, E., Bartel, S. Borden, C., Gross, E., Miller, C., & Ponte, P.R. (2007). Creating a fair and just culture: One institution's path towards organizational change. *Joint Commission Journal on Quality and Patient Safety*, 33(10), 617-624.
- Cox, S.A. (1999). Group communication and employee turnover: How coworkers encourage peers to voluntarily exit. *Southern Communication Journal*, 64, 181.
- Cropanzano, R. & Mitchell, M.S. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management*, 31(6), 874-900.
- de Cremer, D. & Sedikides, C. (2005). Self-uncertainty and responsiveness to procedural justice. *Journal of Experimental Social Psychology*, 41(2), 157-173.
- Dekker, S. (2007). *Just culture. Balancing safety and accountability*. Adlershot: Ashgate.
- Driscoll, J.W. (1978). Trust and participation in organizational decision making as predictors of satisfaction. *The Academy of Management Journal*, 21(1), 44-56.
- Edwards, Allen (1957). *The social desirability variable in personality assessment and research*. New York: The Dryden Press.

- Emerson, R.M. (1976). Social exchange theory. *Annual Review of Sociology*, 2, 335-362.
- Field, J. (2008). Caring to death: discursive analysis of nurses who murder patients.
Adelaide: University of Adelaide.
- Firth-Cozens, J. (2003). Learning from error. In J. Harrison, R. Innes, & T. Van
Zwanenberg (Eds). *Regaining trust in health care*. Abingdo: Radcliffe Medical
Press.
- Flin, R., Mearns, K., O'Connor, P., & Bryden, R. (2000). Measuring safety climate:
Identifying the common features. *Safety Science*, 34, 177-192.
- Frese, M. (2008). *Error management or error prevention: Two strategies to deal with
errors in software design*. Universitätsbibliothek.
- Frese, M. & Keith, N. (2015). Action errors, error management, and learning in
organizations. *Annual Review of Psychology*, 66, 661-687.
- Gergen, K.J., Greenberg, M.S., & Willis, R.H. (1980). Social exchange: Advances in
theory and research. Plenum Press.
- Greenberg, J. (1990). Organizational justice: Yesterday, today, and tomorrow. *Journal of
Management*, 16(2), 399-432.
- Greenberg, J. (1987). A taxonomy of organizational justice theories. *The Academy of
Management Review*, 12(1), 9-22.
- Greenberg, J. (2001). Studying organizational justice cross-culturally: Fundamental
challenges. *International Journal of Conflict Management*, 12(4), 365-375.
- Guldenmund, F.W. (2000). The nature of safety culture: A review of theory and research.
Safety Sciences, 34, 215-257.

- Gunningham, N. & Sinclair, D. (2017) Smart regulation. In P. Drahos (Eds.). Regulated theory: Foundations and applications. ANU Press. 133-148.
- Hayes, L.J., O'Brien-Pallas, L., Dunffield, C., Shamian, J., Buchan, J., Hughes, F., Spence-Laschinger, H.K., North, N, & Stone, P.W. (2006). Nurse turnover: A literature review. *International Journal of Nursing Studies*, 43(2), 237-263.
- Hayes, B.E., Perander, J., Smecko, T., & Trask, J. (1998). Measuring perceptions of workplace safety: Development and validation of the work safety scale. *Journal of Safety Research*, 29(3), 145-161.
- Høivik D. (2010). *HSE and Culture in the Petroleum Industry in Norway*. Paper presented at the SPE International Conference on health, safety and environment in oil and gas exploration and production, Rio de Janeiro, Brazil.
- Hofmann, D. A., et al. (2003). Climate as a moderator of the relationship between leader-member exchange and content specific citizenship: Safety climate as an exemplar. *Journal of Applied Psychology*, 88(1): 170.
- Homans, G.C. (1958). Social behavior as exchange. *American Journal of Sociology*, 63, 597-606.
- Houston, F.S., Gassenheimer, J.B., & Moskulka, J.M. (1992). *Marketing exchange transactions and relationships*. Westport, CT: Quorum Books.
- Hu, L.T. & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55.
- Hudson, P.T.W., Bryden, R., Vuijk, M., Biela, D., & Cowley, C. (2007). Meeting expectations: A new model of just and fair culture. In SPE International

Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production, Nice, France.

Hudson, P.T., Parker, D., Lawton, R., Verschuur, W., & Klaff, J. (2000). The hearts and minds project: Creating intrinsic motivation for HSE. Society of Petroleum Engineers Language English Document. 10.2118/61095-MS.

Hughes, R. & Huby, M. (2002). The application of vignettes in social and nursing research. *Journal of Advanced Nursing*, 37(4), 382-386.

James, J. T. (2013). A new, evidence-based estimate of patient harms associated with hospital care. *Journal of Patient Safety*, 9(3): 122-128.

Jeffcott, S., Pidgeon, N., Weyman, A., & Walls, J. (2006). Risk, trust, and safety culture in U.K. train operating companies. *Risk Analysis*, 26(5), 1105-1121.

Karriker, J.H., & Williams, M.L. (2009). Organizational justice and organizational citizenship behavior: A mediated multifoci model. *Journal of Management*, 35(1), 112-135.

Karsh, B., et al. (2006). A human factors engineering paradigm for patient safety: designing to support the performance of the healthcare professional. *Quality and Safety in Health Care*, 15(suppl 1): i59-i65.

Khatri, N., et al. (2009). From a blame culture to a just culture in health care. *Health Care Management Review*, 34(4), 312-322.

Ko, Y., & Yu, S. (2017). The relationships among perceived patients' safety culture, intention to report errors, and leader coaching behavior in nurses in Korea: A pilot study. *Journal of Patient Safety*, 13, 175-183.

- Kohn, L. T. (2001). The Institute of Medicine report on medical error: overview and implications for pharmacy. *American Journal of Health-System Pharmacy*, 58(1), 63-66.
- Kohn, L. T., et al. (2000). Institute of Medicine, Committee on Quality Health Care in America. To err is human: building a safer health system. Report of the Institute of Medicine, Washington DC: National Academy Press.
- Lam, S.K (1997). Test-retest reliability of the organizational commitment questionnaire. *The Journal of Social Psychology*, 138(6), 787-788.
- Lane C. (2000). Introduction: theories and issues in the study of trust. In C. Lane & R. Bachmann (Eds.), *Trust within and between organizations: Conceptual issues and empirical applications* (1–30). Oxford: Oxford University Press.
- Leape, L.L., et al., (1991). The nature of adverse events in hospitalized patients – results of the Harvard medical practice study III. *The New England Journal of Medicine*, 324, 377-384.
- Levinson, D. R. & General, I. (2010). Adverse events in hospitals: national incidence among Medicare beneficiaries. Department of Health and Human Services Office of the Inspector General.
- Lewicki, R.J., McAllister, D.J., & Bies, R.J. (1998). Trust and distrust: New relationships and realities. *The Academy of Management Review*, 23(3), 438-458.
- Lewicki, R.J., Wiethoff, C., & Tomlison, E.C. (2005). What is the role of trust in organizational justice? In J. Greenberg & J.A. Colquitt (Eds.), *Handbook of organizational justice*. Lawrence Erlbaum Associates Publishers.

- Liden, R. C., Sparrowe, R.T., & Wayne, S.J. (1997). Leader-member exchange theory: The past and potential for the future. In G.R. Ferris (Ed.) *Research in personnel and human resources management*, Vol. 15. Greenwich, CT: JAI.
- Marx, D. (2001). Patient safety and the “just culture”: A primer for health care executives. New York, NY: Columbia University.
- Masterson, S.S., Lewis, K., Goldman, B.M., & Susan, M. (2000). Integrating injustice and social exchange: The differing effects of fair procedures and treatment on work relationships. *The Academy of Management Journal*, 43(4), 738-748.
- Mayer, R.C., Davis, J.H., & Schoorman, F.D. (1995). An integrative model of organizational trust. *The Academy of Management Review*, 20(3), 709-734.
- McArdle, J.J., & McDonald, R.P. (1984). Some algebraic properties of the reticular action model for moment structures. *British Journal of Mathematical and Statistical Psychology*, 37(2), 234-251.
- Mearns, K., Whitaker, S.M., & Flin, R. (2003). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science*, 41(8), 641-680.
- Mearns, K., Whitaker, S., Flin, R., Gordon, R., & O'Connor, P. (2000). *Benchmarking human and organisational factors in offshore safety* (No. Report 2000 036). London: HSE OTO.
- Meuthing, S., Goudie, A., Schoettker, P.J., et al. (2012). Quality improvement initiative to reduce serious safety events and improve patient safety culture. *Pediatrics*, 130(2), 423-431.

- Meyer, J.P., & Allen, N.J. (1988). Links between work experiences and organizational commitment during the first year of employment: A longitudinal analysis. *Journal of Occupational Psychology*, 61(3), 195-209.
- Meyer, J.P. & Parfyonova, N.M. (2010). Normative commitment in the workplace: A theoretical analysis and re-conceptualization. *Human Resource Management Review*, 20(4), 283-294.
- Milliman (2010). The economic measurement of medical errors. Society of Actuaries.
- Mishra, J. & Morrissey, M.A. (1990). Trust in employee/employer relationships: A survey of west Michigan managers. *Public Personnel Management*, 19(4), 443-486.
- Montada, L. (1998). Belief in a just world: A hybrid of justice motive and self-interest? In L. Montada & M.J. Lerner (Eds.), *Critical issues in social justice. Responses to victimizations and belief in a just world*. Plenum Press.
https://doi.org/10.1007/978-1-4757-6418-5_12
- Moorman, R.H., Blakely, G.L., & Niehoff, B.P. (1998). Does perceived organizational support mediate the relationship between procedural justice and organizational citizenship behavior? *The Academy of Management Journal*, 41(3), 351-357.
- Moorman, R.H. & Byrne, Z.S. (2005). How does organizational justice affect organizational citizenship behavior? In J. Greenberg & J.A. Colquitt (Eds.), *Handbook of organizational justice*. Lawrence Erlbaum Associates Publishers.
- Mowday, R.T., Steers, R.M., & Porter, L.W. (1979). The measurement of organizational commitment. *Journal of Vocational Behavior*, 14(2), 224-247.

- Muthén, L.K. and Muthén, B.O. (2017). *Mplus User's Guide* (8th ed.). Muthén & Muthén: Los Angeles, CA.
- Ng, T.W., & Feldman, D.C. (2013). A meta-analysis of the relationships of age and tenure with innovation-related behavior. *British Journal of Social Psychology*, 86(4), 585-616.
- O'Reilly, C.A., & Chatman, J. (1986). Organizational commitment and psychological attachment: The effects of compliance, identification, and internalization on prosocial behavior. *Journal of Applied Psychology*, 71(3), 492-499.
- Perrow, C. (1984). Normal accidents. Living with high-risk technologies. Basic books.
- Peterson, L., Homer, A.L., & Wonderlich, S.A. (1982). The integrity of independent variables in behavior analysis. *Journal of Applied Behavioral Analysis*, 15(4), 477-492.
- Petroleum Safety Authority Norway (2004). *HSE and Culture* (2nd ed.). Stavanger: Petroleum Safety Authority Norway.
- Podsakoff, P.M., MacKenzie, S.B., & Bommer, W.H. (1996). Transformational leader behaviors and substitutes for leadership as determinants of employee satisfaction, commitment, trust, and organizational citizenship behaviors. *Journal of Management*, 22(2), 259-298.
- Reason, J. (1990). *Human error*. Cambridge University Press.
- Reason, J. (1995). Understanding adverse events: human factors. *Quality in Health Care*, 4(2), 80-89.
- Reason, J. (1997). *Managing the risks of organizational accidents*. Aldershot: Ashgate.

- Reason, J. (1998). Achieving a safe culture: theory and practice. *Work & Stress*, 12(3), 293-306.
- Reason, J. (2000). Human error: Models and management. *Western Journal of Medicine*, 172(6), 393.
- Reason, J., et al. (1990). Errors and violations on the roads: a real distinction? *Ergonomics*, 33(10-11), 1315-1332.
- Reiman, T., & Norros, L. (2002). Regulatory culture: A case study in Finland. *Proceedings of the IEEE 7th Conference on Human Factors and Power Plans*, 5-5
- Robinson, S.L. (1996). Trust and breach of the psychological contract. *Administrative Science Quarterly*, 41(4), 574-599.
- Robinson, S.L. & Morrison, E. (1995). Psychological contracts and OCB: The effect of unfulfilled obligations on civic virtue behavior. *Journal of Organizational Behavior*, 16, 289-298.
- Robinson, S.L., & Rousseau, D.M. (1994). Violating the psychological contract: Not the exception but the norm. *Journal of Organizational Behavior*, 15(3), 245-259.
- Rousseau, D.M., Sitkin, S.B., Burt, R.S., & Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of Management Review*, 23(3), 393-404.
- Riketta, M. (2002). Attitudinal organizational commitment and job performance: a meta-analysis. *Journal of Organizational Behavior*, 23(3), 257-266.
- Satorra, A., & Bentler, P.M. (2010). Ensuring positiveness of the scaled difference chi-square test statistic. *Psychometrika*, 75, 243-248.

- Schafer JL. (1999). Multiple imputation: A primer. *Statistical Methods in Medical Research*, 8(1), 3-15.
- Schein, V.E., & Diamante, T. (1988). Organizational attraction and the person-environment fit. *Psychological Reports*, 62, 167-173.
- Shanafelt, T.D., Bradley, K.A., Wipf, J.E., & Beck, A.L. (2002). Burnout and self-reported patient care in an internal medicine residency program. *Annals Internal Medicine*, 136(5), 358-367.
- Singh, H., et al. (2007). Medical errors involving trainees: A study of closed malpractice claims from 5 insurers. *Archives of Internal Medicine*, 167(19), 2030-2036.
- Song, N. C., et al. (2007). The factors (job burnout, job engagement, the workplace safety) influencing employees' job satisfaction in school food service operations. *Korean Journal of Community Nutrition*, 12(5), 606-616.
- Sorra, J.S., & Dyer, N. (2010). Multilevel psychometric properties of the AHRQ hospital survey on patient safety culture. *BMC Health Services Research*, 10, 199.
- Sorra, J.S., Famolaro, T., Dyer, N., Nelson, D., & Smith, S.A. (2012). Hospital survey on patient safety culture: 2012 user comparative database report. (Prepared by Westat, Rockville, MD under Contract No. HHS 290200710024C). Rockville, MD: Agency for Healthcare Research and Quality, February 2012. AHRQ Publication No. 12-0017.
- Suresh, G., et al. (2004). Voluntary anonymous reporting of medical errors for neonatal intensive care. *Pediatrics*, 113(6), 1609-1618.

- Tangirala, S. & Ramanujam, R. (2008). Employee silence on critical work issues: The cross level effects of procedural justice climate. *Personnel Psychology*, *61*(1), 37-68.
- Thibaut, J., & Walker, L. (1975). *Procedural justice: A psychological analysis*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Tucker, L.R. & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, *38*(1), 1-10.
- Turner, N., et al. (2005). Railing for safety: Job demands, job control, and safety citizenship role definition. *Journal of Occupational Health Psychology*, *10*(4), 504.
- von Thaden, T., Hoppes, M., Li, Y., & Gibbons, A. (2006). Validating a just culture measure in healthcare. Technical Report AHFD-06-10.
- Walster, E., Berscheid, E., & Walster, W. (1973). New directions in equity research. *Journal of Personality and Social Psychology*, *25*(2), 151-176.
- Waring, J.J. (2005). Beyond blame: Cultural barriers to medical incident report. *Soc Sci Med*, *60*(9), 1927-1935.
- West, C. P., et al. (2006). Association of perceived medical errors with resident distress and empathy: a prospective longitudinal study. *Journal of the American Medical Association (JAMA)*, *296*(9), 1071-1078.
- Williams, J.K. (2013). Theory of organizational attractiveness. In E.H. Kessler (Ed). *Encyclopedia of management theory*. SAGE publications, Ltd.
<http://dx.doi.org/10.4135/9781452276090>

- Whitener, E.M., Brodt, S.E., Korsgaard, M.A., & Werner, J.M. (1998). Understanding managerial trustworthy behavior. *The Academy of Management Review*, 23(3), 513-530.
- Wu, A. W. (2000). Medical error: The second victim. The doctor who makes the mistake needs help too. *British Medical Journal*, 320(7237), 726-727.
- Wu, J.-H., et al. (2008). Testing the technology acceptance model for evaluating healthcare professionals' intention to use an adverse event reporting system. *International Journal for Quality in Health Care*, 20(2), 123-129.
- Zand, D.E. (1972). Trust and managerial problem solving. *Administrative Science Quarterly*, 17, 229-239.

Appendix A1

Punitive Error Management, Severe Harm Condition

|| EVENT INVESTIGATION SUMMARY

BRIEF DESCRIPTION OF THE EVENT

A mislabeled blood sample was used to type and cross units for a new patient. During a subsequent blood transfusion, the patient experienced severe hemolytic transfusion reaction and was transferred to the ICU. The patient went into **renal failure and died** in the ICU.

INVESTIGATION SUMMARY

1. What happened?

The patient was asleep when a nurse arrived to draw a blood sample. When the nurse turned on the lights to check the patient's requisition and armband, the patient woke up angrily, screamed at the nurse for interrupting her sleep, and demanded that she hurry. The nurse drew the sample quickly and turned the lights back off, then left the room to label the tubes at the nursing station.

At the nursing station, an unlabeled tube of blood from a different patient was laying nearby. Not noticing this, the nurse mistakenly thought one of her tubes had rolled away, so she labeled it with her patient's information. That mislabeled tube was used to type and cross units for the patient. As a result, **the patient died from renal failure** following a blood transfusion.

2. What should have happened?

According to policy, the nurse should have labeled **all** of the patient's tubes at the bedside. This would have reduced the likelihood that any tubes will be mislabeled.

3. Why didn't it happen that way?

Staff generally felt that patient satisfaction was a top priority for their manager.

- The nurse manager frequently scolded nurses about low satisfaction scores during staff meetings and told nurses they must improve their unit's satisfaction scores. In addition, de-identified patient scores and comments being shared during staff meetings (leading to some embarrassment for nurses involved in the care). Many staff also believed that their patient satisfaction scores were being used in their performance reviews.
- The nurse described her choice to label the tubes at the nursing station as an effort to keep her patient happy. She hoped this would result in high satisfaction scores from her patient.

The nurse did not think her behavior was unsafe.

- The nurse knew about the tube labeling policy, but she genuinely did not recognize the risks associated with breaking policy. Because she had already positively identified the patient and was only carrying one set of unlabeled tubes, the nurse did not consider that a mislabeling error could still happen. She said her behavior felt like a safe, "common sense" choice at the time.

4. Actions taken to prevent future errors of this type

The hospital determined that the **nurse is responsible for the error**. The following actions will be taken immediately:

- **The nurse must take a non-paid administrative leave** while her case is being considered.
- At a minimum, **the nurse will be required to undergo training on the safety procedures** at the hospital and demonstrate awareness of how these policies work to keep patients safe.
- **Additional disciplinary actions, up to and including dismissal or reassignment, will be applied as appropriate.**

Appendix A2

Error Vignette: Blameless EM + Severe Harm

|| EVENT INVESTIGATION SUMMARY

BRIEF DESCRIPTION OF THE EVENT

A mislabeled blood sample was used to type and cross units for a new patient. During a subsequent blood transfusion, the patient experienced severe hemolytic transfusion reaction and was transferred to the ICU. The patient went into **renal failure and died** in the ICU.

INVESTIGATION SUMMARY

5. What happened?

The patient was asleep when a nurse arrived to draw a blood sample. When the nurse turned on the lights to check the patient's requisition and armband, the patient woke up angrily, screamed at the nurse for interrupting her sleep, and demanded that she hurry. The nurse drew the sample quickly and turned the lights back off, then left the room to label the tubes at the nursing station.

At the nursing station, an unlabeled tube of blood from a different patient was laying nearby. Not noticing this, the nurse mistakenly thought one of her tubes had rolled away, so she labeled it with her patient's information. That mislabeled tube was used to type and cross units for the patient. As a result, **the patient died from renal failure** following a blood transfusion.

6. What should have happened?

According to policy, the nurse should have labeled **all** of the patient's tubes at the bedside. This would have reduced the likelihood that any tubes will be mislabeled.

7. Why didn't it happen that way?

Staff generally felt that patient satisfaction was a top priority for their manager.

- The nurse manager frequently scolded nurses about low satisfaction scores during staff meetings and told nurses they must improve their unit's satisfaction scores. In addition, de-identified patient scores and comments being shared during staff meetings (leading to some embarrassment for nurses involved in the care). Many staff also believed that their patient satisfaction scores were being used in their performance reviews.
- The nurse described her choice to label the tubes at the nursing station as an effort to keep her patient happy. She hoped this would result in high satisfaction scores from her patient.

The nurse did not think her behavior was unsafe.

- The nurse knew about the tube labeling policy, but she genuinely did not recognize the risks associated with breaking policy. Because she had already positively identified the patient and was only carrying one set of unlabeled tubes, the nurse did not consider that a mislabeling error could still happen. She said her behavior felt like a safe, "common sense" choice at the time.

8. Actions taken to prevent future errors of this type

The hospital determined that **nursing management is responsible for the error**. The following actions will be taken immediately:

- The nurse should be **consoled** and shown compassion for her involvement in the event.
- **Nurse managers will be expected to institute changes on the unit to encourage safe choices:**
 - Immediately stop highlighting the unit's satisfaction scores regularly in meetings and communicate that the nurse's priorities should be on providing safe, quality care. Instead, satisfaction should be reviewed at a semi-annual basis with staff, and more frequently with upper management, who are in better position to make structural changes that impact satisfaction.
 - Immediately **stop sharing de-identified satisfaction scores or comments** with staff
 - Immediately, clearly communicate that satisfaction scores play **NO** role in performance reviews.
 - Immediately develop and share guidelines for how management will respond to patient complaints or poor ratings. These guidelines should **protect staff that follow safety policies**, even when it angers patients.

Appendix A3

Error Vignette: Just Culture EM + Severe Harm

|| EVENT INVESTIGATION SUMMARY

BRIEF DESCRIPTION OF THE EVENT

A mislabeled blood sample was used to type and cross units for a new patient. During a subsequent blood transfusion, the patient experienced severe hemolytic transfusion reaction and was transferred to the ICU. The patient went into **renal failure and died** in the ICU.

INVESTIGATION SUMMARY

5. What happened?

The patient was asleep when a nurse arrived to draw a blood sample. When the nurse turned on the lights to check the patient's requisition and armband, the patient woke up angrily, screamed at the nurse for interrupting her sleep, and demanded that she hurry. The nurse drew the sample quickly and turned the lights back off, then left the room to label the tubes at the nursing station.

At the nursing station, an unlabeled tube of blood from a different patient was laying nearby. Not noticing this, the nurse mistakenly thought one of her tubes had rolled away, so she labeled it with her patient's information. That mislabeled tube was used to type and cross units for the patient. As a result, **the patient died from renal failure** following a blood transfusion.

6. What should have happened?

According to policy, the nurse should have labeled all of the patient's tubes at the bedside. This would have reduced the likelihood that any tubes will be mislabeled.

7. Why didn't it happen that way?

Staff generally felt that patient satisfaction was a top priority for their manager.

- The nurse manager frequently scolded nurses about low satisfaction scores during staff meetings and told nurses they must improve their unit's satisfaction scores. In addition, de-identified patient scores and comments being shared during staff meetings (leading to some embarrassment for nurses involved in the care). Many staff also believed that their patient satisfaction scores were being used in their performance reviews.
- The nurse described her choice to label the tubes at the nursing station as an effort to keep her patient happy. She hoped this would result in high satisfaction scores from her patient.

The nurse did not think her behavior was unsafe.

- The nurse knew about the tube labeling policy, but she genuinely did not recognize the risks associated with breaking policy. Because she had already positively identified the patient and was only carrying one set of unlabeled tubes, the nurse did not consider that a mislabeling error could still happen. She said her behavior felt like a safe, "common sense" choice at the time.

12. Actions taken to prevent future errors of this type

The hospital determined that **both nursing management and the nurse** played a role in the error. The following actions will be taken immediately:

- The nurse will be supportively **coached** about the safety risk she took when labeling her patient's tubes at the nursing station rather than the bedside.
- The nurse will be invited to **participate in an error prevention and root cause analysis training** where she will learn about how errors may occur when healthcare providers have a false sense of security while deviating from procedures designed to keep patients safe.
- However, the nurse will be warned **that continued non-compliance is not acceptable**. If she is found to knowingly and intentionally deviate from this procedure in the future, she should expect to face disciplinary actions.
- **Nurse managers will be expected to institute changes on the unit to encourage safe choices:**
 - Immediately stop highlighting the unit's satisfaction scores regularly in meetings and **communicate that the nurse's priorities should be on providing safe, quality care**. Instead, satisfaction should be reviewed at a semi-annual basis with staff, and more frequently with upper management, who are in better position to make structural changes that impact satisfaction.
 - Immediately **stop sharing de-identified satisfaction scores or comments** with staff
 - Immediately, clearly communicate that satisfaction scores play **NO** role in performance reviews.
 - Immediately develop and share guidelines for how management will respond to patient complaints or poor ratings. These guidelines should **protect staff that follow safety policies**, even when it angers patients.

Appendix A4

Error Vignette: Punitive EM + No Harm

|| EVENT INVESTIGATION SUMMARY

BRIEF DESCRIPTION OF THE EVENT

A mislabeled blood sample was used to type and cross units for a new patient. During a subsequent blood transfusion, the patient experienced **no adverse effect**.

INVESTIGATION SUMMARY

13. What happened?

The patient was asleep and woke up angrily when a nurse turned on the lights to check the patient's requisition and armband. The patient screamed at the nurse for interrupting her sleep and demanded that she hurry. The nurse drew the sample quickly and turned the lights back off, then left the room to label the tubes at the nursing station.

At the nursing station, an unlabeled tube of blood from a different patient was laying nearby. Not noticing this, the nurse mistakenly thought one of her tubes had rolled away, so she labeled it with her patient's information. That mislabeled tube was used to type and cross units for her patient. Despite this, **no harm** came to the patient.

14. What should have happened?

According to policy, the nurse should have labeled **all** of the patient's tubes at the bedside. This would have reduced the likelihood that any tubes will be mislabeled.

15. Why didn't it happen that way?

Staff generally felt that patient satisfaction was a top priority for their manager.

- The nurse manager frequently scolded nurses about low satisfaction scores during staff meetings and told nurses they must improve their unit's satisfaction scores. In addition, de-identified patient scores and comments being shared during staff meetings (leading to some embarrassment for nurses involved in the care). Many staff also believed that their patient satisfaction scores were being used in their performance reviews.
- The nurse described her choice to label the tubes at the nursing station as an effort to keep her patient happy. She hoped this would result in high satisfaction scores from her patient.

The nurse did not think her behavior was unsafe.

- The nurse knew about the tube labeling policy, but she genuinely did not recognize the risks associated with breaking policy. Because she had already positively identified the patient and was only carrying one set of unlabeled tubes, the nurse did not consider that a mislabeling error could still happen. She said her behavior felt like a safe, "common sense" choice at the time.

4. Actions taken to prevent future errors of this type

The hospital determined that the **nurse is responsible for the error**. The following actions will be taken immediately:

- **The nurse must take a non-paid administrative leave** while her case is being considered.
- At a minimum, **the nurse will be required to undergo training on the safety procedures** at the hospital and demonstrate awareness of how these policies work to keep patients safe.
- **Additional disciplinary actions, up to and including dismissal or reassignment, will be applied as appropriate.**

Appendix A5

Error Vignette: Blameless EM + No Harm

|| EVENT INVESTIGATION SUMMARY

BRIEF DESCRIPTION OF THE EVENT

A mislabeled blood sample was used to type and cross units for a new patient. During a subsequent blood transfusion, the patient experienced **no adverse effect**.

INVESTIGATION SUMMARY

13. What happened?

The patient was asleep and woke up angrily when a nurse turned on the lights to check the patient's requisition and armband. The patient screamed at the nurse for interrupting her sleep and demanded that she hurry. The nurse drew the sample quickly and turned the lights back off, then left the room to label the tubes at the nursing station.

At the nursing station, an unlabeled tube of blood from a different patient was laying nearby. Not noticing this, the nurse mistakenly thought one of her tubes had rolled away, so she labeled it with her patient's information. That mislabeled tube was used to type and cross units for her patient. Despite this, **no harm** came to the patient.

14. What should have happened?

According to policy, the nurse should have labeled **all** of the patient's tubes at the bedside. This would have reduced the likelihood that any tubes will be mislabeled.

15. Why didn't it happen that way?

Staff generally felt that patient satisfaction was a top priority for their manager.

- The nurse manager frequently scolded nurses about low satisfaction scores during staff meetings and told nurses they must improve their unit's satisfaction scores. In addition, de-identified patient scores and comments being shared during staff meetings (leading to some embarrassment for nurses involved in the care). Many staff also believed that their patient satisfaction scores were being used in their performance reviews.
- The nurse described her choice to label the tubes at the nursing station as an effort to keep her patient happy. She hoped this would result in high satisfaction scores from her patient.

The nurse did not think her behavior was unsafe.

- The nurse knew about the tube labeling policy, but she genuinely did not recognize the risks associated with breaking policy. Because she had already positively identified the patient and was only carrying one set of unlabeled tubes, the nurse did not consider that a mislabeling error could still happen. She said her behavior felt like a safe, "common sense" choice at the time.

8. Actions taken to prevent future errors of this type

The hospital determined that **nursing management is responsible for the error**. The following actions will be taken immediately:

- The nurse should be **consoled** and shown compassion for her involvement in the event.
- **Nurse managers will be expected to institute changes on the unit to encourage safe choices:**
 - Immediately stop highlighting the unit's satisfaction scores regularly in meetings and communicate that the nurse's priorities should be on providing safe, quality care. Instead, satisfaction should be reviewed at a semi-annual basis with staff, and more frequently with upper management, who are in better position to make structural changes that impact satisfaction.
 - Immediately **stop sharing de-identified satisfaction scores or comments** with staff
 - Immediately, clearly communicate that satisfaction scores play **NO** role in performance reviews.
 - Immediately develop and share guidelines for how management will respond to patient complaints or poor ratings. These guidelines should **protect staff that follow safety policies**, even when it angers patients.

Appendix A6

Error Vignette: Just Culture EM + No Harm

|| EVENT INVESTIGATION SUMMARY

BRIEF DESCRIPTION OF THE EVENT

A mislabeled blood sample was used to type and cross units for a new patient. During a subsequent blood transfusion, the patient experienced **no adverse effect**.

INVESTIGATION SUMMARY

13. What happened?

The patient was asleep and woke up angrily when a nurse turned on the lights to check the patient's requisition and armband. The patient screamed at the nurse for interrupting her sleep and demanded that she hurry. The nurse drew the sample quickly and turned the lights back off, then left the room to label the tubes at the nursing station.

At the nursing station, an unlabeled tube of blood from a different patient was laying nearby. Not noticing this, the nurse mistakenly thought one of her tubes had rolled away, so she labeled it with her patient's information. That mislabeled tube was used to type and cross units for her patient. Despite this, **no harm** came to the patient.

14. What should have happened?

According to policy, the nurse should have labeled **all of** the patient's tubes at the bedside. This would have reduced the likelihood that any tubes will be mislabeled.

15. Why didn't it happen that way?

Staff generally felt that patient satisfaction was a top priority for their manager.

- The nurse manager frequently scolded nurses about low satisfaction scores during staff meetings and told nurses they must improve their unit's satisfaction scores. In addition, de-identified patient scores and comments being shared during staff meetings (leading to some embarrassment for nurses involved in the care). Many staff also believed that their patient satisfaction scores were being used in their performance reviews.
- The nurse described her choice to label the tubes at the nursing station as an effort to keep her patient happy. She hoped this would result in high satisfaction scores from her patient.

The nurse did not think her behavior was unsafe.

- The nurse knew about the tube labeling policy, but she genuinely did not recognize the risks associated with breaking policy. Because she had already positively identified the patient and was only carrying one set of unlabeled tubes, the nurse did not consider that a mislabeling error could still happen. She said her behavior felt like a safe, "common sense" choice at the time.

12. Actions taken to prevent future errors of this type

The hospital determined that **both nursing management and the nurse** played a role in the error. The following actions will be taken immediately:

- The nurse will be supportively **coached** about the safety risk she took when labeling her patient's tubes at the nursing station rather than the bedside.
- The nurse will be invited to **participate in an error prevention and root cause analysis training** where she will learn about how errors may occur when healthcare providers have a false sense of security while deviating from procedures designed to keep patients safe.
- However, the nurse will be warned **that continued non-compliance is not acceptable**. If she is found to knowingly and intentionally deviate from this procedure in the future, she should expect to face disciplinary actions.
- **Nurse managers will be expected to institute changes on the unit to encourage safe choices:**
 - Immediately stop highlighting the unit's satisfaction scores regularly in meetings and **communicate that the nurse's priorities should be on providing safe, quality care**. Instead, satisfaction should be reviewed at a semi-annual basis with staff, and more frequently with upper management, who are in better position to make structural changes that impact satisfaction.
 - Immediately **stop sharing de-identified satisfaction scores or comments** with staff
 - Immediately, clearly communicate that satisfaction scores play **NO** role in performance reviews.
 - Immediately develop and share **guidelines for how management will respond to patient complaints or poor ratings**. These guidelines should **protect staff that follow safety policies**, even when it angers patients.

Appendix B1
Manipulation Check

1. In the scenario, did the nurse follow the steps of the blood labeling policy?
 - a. Yes
 - b. No

2. In the scenario, what was the outcome for the patient?
 - a. The patient was not harmed
 - b. The patient experienced a harm event, but was effectively treated
 - c. The patient experienced a harm event and did not survive

3. In the scenario, who did the hospital determine was the responsible for the event?
 - a. Determined the nurse was responsible
 - b. Determined management was responsible
 - c. Determined both the nurse and management were responsible
 - d. Determined neither the nurse nor management was responsible

Appendix B2
Organizational Attractiveness items

1. I feel I would fit in this organization.
2. I would feel at home working for an organization like this.
3. I would very much like to work for this organization.
4. This organization will likely meet my desires and needs.

Appendix B3
Organizational Trust items

1. I am not sure I fully trust this employer.
2. This employer will be open and upfront with me.
3. I believe this employer has high integrity.
4. In general, I believe this employer's motives and intentions are good.
5. This employer is not always honest and truthful.
6. I can expect this employer to treat me in a consistent and predictable fashion.

Appendix B4
Perceived Organizational Justice items

1. Overall, I'm treated fairly by this organization.
2. In general, I can count on this organization to be fair.
3. In general, the treatment I receive around here is fair.
4. Usually, the way things work in this organization are not fair.
5. For the most part, this organization treats its employees fairly.
6. Most of the people who work here would say they are often treated unfairly.

Appendix B5
Organizational Commitment items

1. I would be willing to put in a great deal of effort beyond that normally expected in order to help this hospital be successful.
2. I would talk up this organization to my friends as a great company to work for.
3. I would feel very little loyalty to this organization.
4. I would accept almost any type of job assignment in order to keep working for this organization.
5. I find that my values and the organization's values are very similar.
6. I would be proud to tell others that I am part of this organization.
7. I could just as well be working for a different organization as long as the type of work were similar.
8. This organization would really inspire the very best in me in the way of job performance.
9. It would take very little change in my present circumstances to cause me to leave this organization.
10. I would be extremely glad that I chose this organization to work for over others.
11. There's not too much to be gained by sticking with this organization indefinitely.
12. Often I find it difficult to agree with this organization's policies on important matters relating to its employees.
13. I really care about the fate of this organization.
14. For me this is the best of all possible organizations for which to work.
15. Deciding to work for this organization would be a definite mistake on my part.

Appendix B6
Safety Compliance items

1. Overlook safety procedures in order to get my job done more quickly.
2. Follow all safety procedures regardless of the situation I am in.
3. Handle all situations as if there is a possibility of having an accident.
4. Wear safety equipment required by practice.
5. Keep my work area clean.
6. Encourage coworkers to be safe.
7. Keep my work equipment in safe working condition.
8. Take shortcuts to safe working behaviors in order to get the job done faster.
9. Follow safety rules even if I think they are unnecessary.
10. Report safety problems to my supervisor when I see safety problems.
11. Correct safety problems to ensure accidents will not occur.

Appendix B7
Error Reporting items

1. If I committed an error that had no adverse effect on patients, I would report the error to the organization.
2. If my colleague committed an error with no adverse effect on patients, I would report the error to the organization.
3. I would share information regarding errors or malpractice with the organization.

Appendix B8
Demographic Questionnaire

Gender (circle one) Male Female Other

Age: _____

Number of years in Nursing Program: _____

1. Have you ever been harmed by an error while receiving medical care?

Yes	No
-----	----

2. Have you ever made an error while delivering medical care?

Yes	No
-----	----

3. How familiar are you with the concept of Just Culture?

Extremely familiar	Moderately familiar	Neutral	Slightly familiar	Not at all familiar
--------------------	---------------------	---------	-------------------	---------------------

4. Have you heard the news about a recent incident at Vanderbilt, where a nurse's medication error resulted in a patient death?

Yes	No
-----	----

5. How familiar are you with the specifics of the Vanderbilt case, and the outcome for the nurse involved in this incident?

Extremely familiar	Moderately familiar	Neutral	Slightly familiar	Not at all familiar
--------------------	---------------------	---------	-------------------	---------------------

6. Based on your knowledge of the event, do you agree with the approach Vanderbilt took in handling the nurse involved in the incident?

Yes – I agree with the approach	No – I don't agree with the approach	Not familiar enough to make a judgement
---------------------------------	--------------------------------------	---

7. How concerned are you about the precedent set by the Vanderbilt case for your chosen career?

Extremely concerned	Moderately concerned	Neutral	Slightly concerned	Not at all concerned	Not familiar enough with case to make a judgement
---------------------	----------------------	---------	--------------------	----------------------	---

Appendix C1

Multi-group Error Management Models

Cross-group equality tests were conducted to assess the degree to which study mediators were similarly associated with attitudinal and behavioral intention outcomes across the three error management conditions. In the multi-group analyses, the primary study path coefficients were constrained to be equal, allowing for comparisons of model fit to test the degree to which the model maintains overall goodness of fit.

The attitudinal model included organizational justice, organizational trust, and event severity as exogenous variables and allowed to covary. Event severity was kept in the model, producing an over-identified variance-covariance matrix that would render goodness of fit statistics. The fit of the attitudinal model with parameters constrained [χ^2 (14) = 19.124, p = .16, CFI = .99, TLI = .98, RMSEA = .07, 90% CI [.00, .13], SRMR = .06] did not significantly improve with constraints removed constrained [χ^2 (6) = 6.211, p = .4, CFI = 1.00, TLI = .99, RMSEA = .02, 90% CI [.00, .14], SRMR = .02; χ^2 diff (8) = 12.91, p = .11]. The primary associations between perceptions and organizational attitudes did not differ across error management conditions.

Similarly, in the behavioral intentions model, organizational justice, organizational trust, familiarity with just culture were identified as exogenous variables and allowed to covary; intentions for error reporting and safety compliance were exogenous. The primary paths between study variables were constrained to zero producing acceptable fit, [χ^2 (26) = 28.110, p = .35 (Scaling Correction Factor for MLR=1.0465), CFI = .97, TLI = .97, RMSEA = .03, 90% CI [.00, .10], SRMR = .07]. . The fit of the behavioral model with parameters constrained did not significantly improve

with constraints removed [$\chi^2 (18) = 19.058, p = .38$ (Scaling Correction Factor for MLR=.9779), CFI = .99, TLI = .98, RMSEA = .03, 90% CI [.00, .10], SRMR = .06; Satorra-Bentler scaled χ^2 diff (8) = 8.977, p = .34], suggesting that across error management groups, perceptions had similar effects on outcome variables. These findings are summarized in Table 21.

Table 21
Overview of multi-group error management fit statistics and model comparison

	χ^2	<i>df</i>	χ^2 diff	Δdf	RMSEA	CFI	TLI	SRMR
Attitudes								
Constrained	19.124	14			.07	.99	.98	.06
Not constrained	6.211	6	12.913	8	.02	1.00	.99	.03
Behaviors								
Constrained	28.110	26			.03	.97	.97	.07
Not constrained	19.058	18	8.977	8	.03	.99	.98	.06

Appendix C2

Alternative models

Attitudes. Analysis suggested acceptable model fit for the partial mediation attitudes model, [$\chi^2(2) = .423, p = .81, CFI = 1.00, TLI = 1.00, RMSEA = .00, 90\% CI [.00, .07], SRMR = .01$]. Similar to the previous analysis, direct path coefficients suggest that justice and trust had significant associations with commitment (OJ: $\beta = .413 (.042), p < .001$; OT: $\beta = .530 (.072), p < .001$) and attraction (OJ: $\beta = .269 (.043), p < .001$; OT: $\beta = .623 (.074), p < .001$). Neither punitive nor blameless error management had direct effects on attraction (Punitive: $\beta = -.071 (.109), p = .518$; Blameless: $\beta = -.009 (.104), p = .931$).

The differences in attraction between punitive and just culture was due to significant paths through both organizational trust ($\beta = -.219 (.081), p = .007$) and justice ($\beta = -.249 (.070), p < .001$). Similarly, the differences in attraction between blameless and just culture was due to significant paths through both organizational trust ($\beta = -.243 (.079), p = .002$) and justice ($\beta = -.136 (.060), p = .022$). The difference in commitment between punitive and just culture was due to significant paths through both organizational trust ($\beta = -.186 (.070), p = .008$) and justice ($\beta = -.382 (.097), p < .001$); but also due to a significant direct path to commitment ($\beta = -.243 (.107), p = .023$). However, the difference in commitment between blameless and just culture was due to significant paths through both organizational trust ($\beta = -.206 (.069), p = .003$) and justice ($\beta = -.209 (.088), p = .017$), but blameless error management showed no significant direct effect on commitment ($\beta = .001 (.101), p < .990$). Finally, event severity was not directly associated

with either organizational justice ($\beta = .109 (.171), p = .522$). or trust ($\beta = .157 (.098), p = .110$).

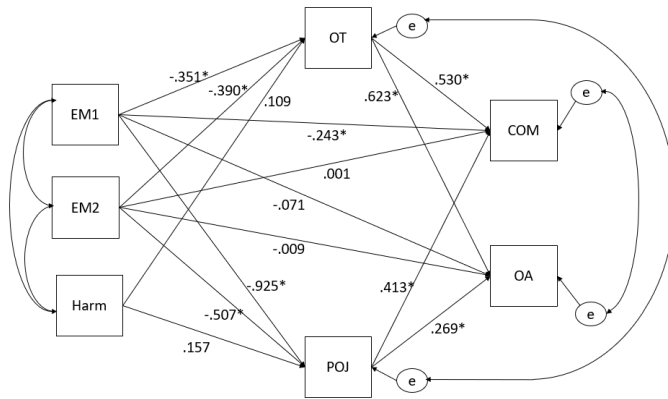


Figure 11. Organizational-Focused Attitudes Partial Mediation Path Model

Behavior intentions. Analysis suggested acceptable goodness of fit for the partial mediation behavioral intention model, [$\chi^2 (6) = 7.564, p = .44$ (Scaling Correction Factor for MLR=.977), CFI = 1.00, TLI = 1.00, RMSEA = .00, 90% CI [.00, .08], SRMR = .02]. Examination of the parameter estimates revealed a direct effect of blameless error management with compliance explained some of the remaining variance between blameless and just culture error management ($\beta = -.199 (.112), p = .050$). All other significant associations remained substantially unchanged from the prior model: negative associations between punitive and blameless conditions and organizational justice (Punitive: $\beta = -.925 (.216), p < .001$; Blameless: $\beta = -.507 (.203), p = .012$) and organizational trust (Punitive: $\beta = -.351 (.127), p = .006$; Blameless: $\beta = -.390 (.118), p = .001$); as well as, positive associations between organizational justice and safety compliance (OJ: $\beta = .147 (.060), p = .014$). The difference in blameless and just culture

error management on safety compliance was due to the indirect effects of organizational justice ($\beta = -.136 (.067)$, $p = .043$).

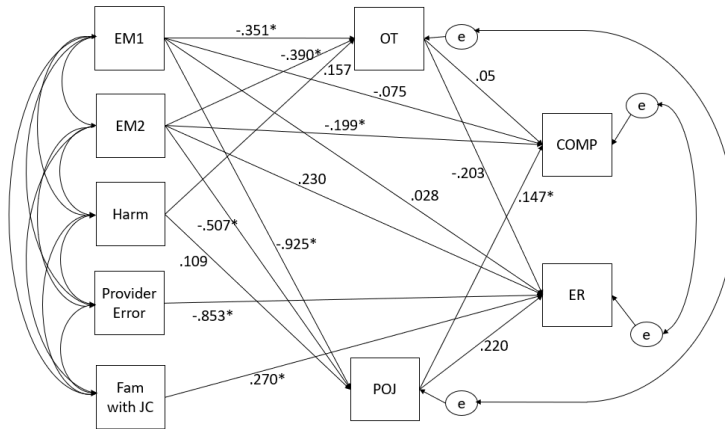


Figure 12. Individual-Focused Behavioral Intention Partial Mediation Path Model