UNIVERSITY OF CALIFORNIA

Los Angeles

Adverse Event Reporting Among US Nurses

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Nursing

by

Loretta Yukshan So

2020

ABSTRACT OF THE DISSERTATION

Adverse Event Reporting Among US Nurses

by

Loretta Yukshan So

Doctor of Philosophy in Nursing

University of California, Los Angeles, 2020

Professor Emerita Carol Pavlish, Chair

This dissertation features the three-manuscript option.

Objective. Healthcare's efforts to prevent adverse events include initiatives to encourage

adverse event reporting so it becomes possible to explore causes and prevent recurrence.

However, the current climate of significant underreporting of adverse events by healthcare

providers curtails the opportunity to explore preventable medical errors, improve system care

delivery processes, and achieve better patient outcomes. The purpose of this study was to

investigate the relationship between structural and psychological empowerment elements and

nurses' reporting of adverse events including near-misses, event has no potential to harm the

patient and event could harm the patient but does not. This study also examined nurses'

identification of different types of adverse events, their intention to report each type, and whether

their professional characteristics (education level, work role, staff position, specialty nursing

certification, and professional society membership) are related to nurses' adverse event reporting.

Methods. A cross-sectional survey study among nurses in a large academic, tertiary and quaternary referral medical system in the Southwest region of the United States of America. Kanter's described elements of organizational empowerment (opportunity, information, support, resources, formal power and informal power), measured by the Condition of Work Effectiveness Questionnaire (CWEQ-II) were compared to adverse event reporting. Spreitzer's Psychological Empowerment Instrument (PEQ), a 12-item scale with three items for each of the four dimensions (meaning, competence, self-determination and impact) was used to compare psychological empowerment to nurses' reporting of adverse events. Specific questions from the Hospital Survey of Patient Safety Culture (HSOPSC) developed by the Agency for Healthcare Research and Quality (AHRQ) were used to measure nurses' reporting of adverse events. The variables analyzed from the HSOPSC survey included: 1) the overall number of events reported by participants in the past 12 months, and 2) three questions measuring nurses' perception of how frequently (never/rarely, sometimes, most of the time, and always) three types of events (near-missed, event with no potential for harm, and event that could harm the patient but does not) are reported on their units.

Results. Study findings indicate no statistically significant association between the number of incidents that participants reported and any of the CWEQ-II and PEQ subscales. All CWEQ-II outcomes with the exception of access to opportunity showed an overall significant difference between categories of frequencies of the three types of adverse event reported (near-missed incident, events with no potential harm, and events with potential harm but did not). Among the four elements of psychological empowerment measured with the PEQ, "impact" consistently

shows a significant difference in nurses' perception of how frequently the three types of adverse events are reported. When provided clinical scenarios with five levels of harm (omission, near miss, no harm, reversible harm, and irreversible harm), participants indicated they would report the event when they were in "strong agreement" with their determination that the scenario was viewed as an adverse event. Nurses' professional characteristics, level of education, work role, level of nursing practice and certification status play a role in nurses' reporting of adverse events. **Implications and Conclusion.** Organizational and nursing leaders should construct a supportive environment that fosters adverse event reporting among nurses. Nurse leaders should cultivate a work environment that improves nurses' empowerment and autonomy, such as shared-governance, which could promote creating evidence-based strategies for delivering safe patient care. Nurse educators can provide a curriculum that emphasizes quality improvement to build a foundation of knowledge and skills needed to implement quality improvement methodologies. Unit directors can encourage nurses to participate in process improvement projects to champion the drive for better patient outcomes. Nursing professional education should emphasize that errors of omission and near-missed events are indeed adverse events and should be reported as opportunities for system improvement. Our findings provide a glance into the needed elements, tailored to special professional characteristics to be taken into consideration when constructing such programs.

The dissertation of Loretta Yukshan So is approved.

Mary-Lynn Brecht

Wendie Robbins

Brennan Mason Ross Spiegel

Carol Pavlish, Committee Chair

University of California, Los Angeles

2020

DEDICATION

To my beloved brother Johnny, for being such a caring brother, cheering me on at every

academic milestones I have reached. I'll miss your gentle soul. I'll always love you.

To my sisters Joanna and Barbara, for always loving me, believing in me, being there for me and

encouraging me to achieve my goals.

TABLE OF CONTENTS

Chapter Four: Manuscript Three

The Association of Nurses' Professional Characteristics and Their Identification and

Reporting of Adverse Events

LIST OF TABLES

Chapter Four: Manuscript Three

The Association of Nurses' Professional Characteristics and Their Identification and

Reporting of Adverse Events

ACKNOWLEDGEMENTS

VITA/BIOGRAPHICAL SKETCH

Master's Study in Nursing Administration
School of Nursing, University of California, Los Angeles

Bachelor of Science in Nursing
University of Phoenix, Los Angeles, California

Diploma of General Nursing
School of Nursing, Queen Elizabeth Hospital, Hong Kong

License and Certifications

Registered Nurse, California, 1990
Certified Gastroenterology Nurse, 1994
Registered Nurse, Hong Kong, 1984

Publications

Pavlish, C., Brown-Saltzman, K., **So, L**., & Wong, J. (2016). SUPPORT: an evidence-based model for leaders addressing moral distress. *Journal of Nursing Administration (JONA), 46*(6), 313–20.

Pavlish, C., Brown-Saltzman, K., **So, L**., Heers, A., & Iorillo, N. (2015). Avenues of action in ethically difficult situations: a critical incident study. *Journal of Nursing Administration (JONA), 45*(6), 311–8.

Huang, B., Conklin, J., **So, L.,** & Kunkel, D. (2014). Using a stent extractor for a case of pill impaction: a novel approach. *Gastrointestinal Endoscopy*, *79*(1), 185–6.

Kendall BJ, Jutabha R, **So L**, Jamidar PA (1995) Determining required stent length in endoscopic retrograde biliary stenting. *Gastrointest Endosc 41*(3):242–243.

Rosen, H.R., Winkle, P.J., Kendall, B.J., Diehl, D.L., **So, L.,** Jamidar, P., & Batch J. (1994). Biliary Interleukin-6 and tumor necrosis factor (TNF-) in patients undergoing ERCP. *Hepatology, 20,* A86.

Chung, S.C.S., Leung, J.W.C., Lo, K.K., **So, L.Y.S.,** & Li, A.K.C. (1990) Does adding a sclerosant improve the results of endoscopic epinephrine injection in actively bleeding ulcers? *Gastrointestinal Endoscopy, 36,* 184.

Chung, S.C.S., Leung, J.W.C., Lo, K.K., **So, L.Y.S.,** & Li, A.K.C.. (1990). Natural history of the sentinel clot, an Endoscopy study. *Gastroenterology*, *98*, A31.

Poster Presentations

Lee, E., **So, L.**, Miller, K. & Phung, J. (2016, October). *Adult In-Hospital Cardiac Arrest and Resuscitation at RR UCLA: A Two-Year Study of Incidence, Etiology, and Outcomes.* Poster presented at UCLA Department of Medicine Research Day, Los Angeles, CA.

Lee, E., **So, L.**, Miller, K. & Flores, J. (2015, October). *Adult In-Hospital Cardiac Arrest and Resuscitation.* Poster presented at the UCLA Department of Medicine Research Day, Los Angeles, CA.

So, L., Pavlish, C., & Brown-Saltzman, K. (2015, March). *Critical Incident Technique (CIT) to explore signs of moral distress among staff and nurse leaders (CNS) in ethically difficult situations.* Poster session presented at the National Nursing Ethics Conference, Los Angeles, CA.

So, L., Pavlish, C., & Brown-Saltzman, K. (2015, February). *Critical Incident Technique (CIT) to explore nurse leaders' experiences with ethically difficult situations and perceptions of risk factors and specifications for ethical conflicts.* Poster session presented at the Association of California Nurse Leader Annual Conference, Anaheim, CA.

Han, S., **So, L.**, & Bedford, R. (1999, May). *Long-term follow-up of endoscopic ally placed biliary wallstents for malignant biliary obstruction.* Poster presented at Digestive Disease Week/American Gastroenterological Association Poster Sessions, Orlando, FL.

Awards and Honors

UCLA Health System Innovation Award, 2017-2018
UCLA University Fellowship Award, 2016–2017
Society of Gastroenterology Nurses and Associates Scholars Program, 2015–2017
UCLA University Fellowship Award, 2012–2013
Barbara Fowler Hoff Endowed Nursing Scholarship, 2011
     (Association of California Nurse Leader)
Donald Leahy Charitable Trust Fund Scholarship, 2009

Journal and Abstract Reviewer

Gastroenterology Nurse Journal, June 2015
UCLA Nursing Practice and Research Council, February 2016

INTRODUCTION TO DISSERTATION

The Institute of Medicine (IOM) report *To Err Is Human* (2000) raised awareness of

healthcare quality and patient safety among healthcare professionals and health organizations to

an unprecedented degree. The epidemiologic findings estimated between 44,000 and 98,000

people expired each year in the United States as a result of medical errors (IOM, 2000). The

IOM called on all healthcare professionals, hospital leaderships, and the federal government to

make improving patient safety a national priority. In response to the IOM report and its

recommendations, the United States Congress, in 2001, allocated an annual budget of $50

million for patient safety research (Leape & Berwick, 2002).

The IOM stated, "An error is defined as the failure of a planned action to be completed as

intended (i.e. error of execution) or the use of a wrong plan to achieve an aim (i.e. error of

planning)" (IOM, 2000, p. 28). The IOM offered this further definition: "An adverse event is an

injury caused by medical management rather than the underlying condition of the patient. An

adverse event attributable to error is a 'preventable adverse event.'" (IOM, 2000, p. 28).

To decrease preventable medical error incidents, the IOM recommended confidential,

voluntary reporting of injuries due to medical care. In 2005, the U.S. Congress authorized the

creation of a "Patient Safety Organizations Program," a voluntary association of health care

entities to promote error reporting and shared learning (Fassett, 2006). However, research

studies have identified an alarmingly low adverse event reporting rate (Backstrom et al., 2004;

Lightdale et al., 2009), which may hinder efforts to reduce medical errors. For example, these

studies identified adverse events underreporting related to non-surgical procedures and sedations

and near-miss events in nursing home facilities (Wagner et al., 2012). Additional studies

revealed underreporting of drug-related adverse events in the U.S. and in Sweden (Backstrom et

al., 2004; Mittmann et al., 2004). Research shows underreporting of adverse drug reactions through the U.S. Food and Drug Administration Adverse Event Reporting System (Alatawi & Hansen, 2017). Indeed, underreporting adverse events is a global issue. Researchers have documented it in the U.S., Australia, Sweden, India, and Canada (Backstrom et al., 2004; Brennan et al., 2000; Leape et al.,1991; Lightdale et al., 2009; Pajuja et al., 2017).

The Purpose of this Study

This cross-sectional survey explored the relationship between elements of structural and psychological empowerment and nurses' reporting of adverse events in the United States.

Specific Aims

1. To describe the relationship between the theory of structural empowerment and nurses' reporting of adverse event.

2. To describe the relationship between psychological empowerment and nurses' reporting of adverse events.

3a. To explore nurses' identification of different types of adverse events and if they would report such events based on their determination of agreement or disagreement.

3b. To describe if professional characteristics such as education, work experience, professional certification, professional membership, and staff position are related to nurses' intent to report adverse events.

Theoretical Framework

Two theories comprise this study's theoretical framework: 1) Kanter's theory of organizational empowerment coupled with 2) Conger and Kanungo's theory of psychological empowerment. First, Rosabeth Kanter's theory of organizational empowerment (1993) provides a strategy for considering how different aspects of organizational power influence nurses'

2

decision-making processes in reporting adverse events. Second, psychological empowerment, as described by Conger and Kanungo (1988), contributes personal factors regarding nurses' determination to report adverse events voluntarily. These two empowerment theories will guide my study's research method, process, and strategies.

Theory of Organizational Empowerment

According to Kanter, the people armed with power in an organization are those who demonstrate high levels of accomplishment (Kanter, 1979). These individuals are capable of gathering information, resources, and support not only to efficiently fulfill their responsibilities but also to accomplish more than other individuals. These high-powered individuals gain access to information through two different sources: formal power and informal power (Kanter, 1979). Formal power comes from individuals' official positions within an organization. Since they are in positions of power, organizational information is readily available to them (Kanter, 1927). This information is not only relevant to their work but can also help them fulfill expectations set by the organization. Informal power comes from an individual's ability to network both inside and outside the organization (Kanter, 1979). Within the organization, high-power individuals form alliances with their peers, subordinates, and other workgroups. These high-power individuals gather information through casual conversations and during social gatherings; to benefit themselves, they can use information collected to influence other employees' actions in the organization. Furthermore, they form connections with people outside the organization, gaining information to which other coworkers do not have access (Kanter, 1979).

Laschinger and colleagues described the formal and informal power structures as the two systemic power factors that exist within an organization (Laschinger et al., 2000). Individuals who have access to these two systemic power factors demonstrate increased work efficiency

(Kanter, 1979). These two systemic power factors influence employees' access to the structure of opportunity and the structure of power.

The structure of opportunity can be defined as employees' access to learn new skills, recognize circumstances to improve themselves, and subsequently advance their careers. As a result, those with access to the structure of opportunity are loyal to the organization and are motivated to do well (Kanter, 1993). The structure of power enables employees' access to information, support, and resources. With access to information, employees feel empowered because such information allows them to perform their jobs well. Employees' access to support can be defined as positive feedback from supervisors, which extends to support from the organization. Employees feel further empowered when they have access to resources, which is defined as access to materials, rewards, and/or financial support. Access to resources ensures that employees can function in the organization effectively (Kanter, 1993).

When individuals gain access to all organizational structural powers, it positively influences job performance (Kanter, 1979). They are highly motivated and perceive an increase in their autonomy. They also feel empowered to make influential decisions, which leads to high levels of job satisfaction with lower rates of burnout. By contrast, individuals who do not have access to organizational power perceive themselves as powerless (Kanter, 1979). They often experience frustration and a decreased level of work productivity. They do not see opportunities to advance their careers within the organization and feel trapped in their jobs. A lack of perceived power leads to dissatisfaction in one's working environment, and can result in decreased work effectiveness, with less desirable outcomes for both the organization and individuals (Kanter, 1979).

Theory of Psychological Empowerment

The central tenet of the theory of psychological empowerment is employees' cognitive belief that they have control over their work. Conger and Kanungo (1988) defined psychological empowerment as "a process of enhancing feelings of self-efficacy among organization members through the identification of conditions that foster powerlessness and through their removal by both formal organization practices and informal techniques of providing efficacy information" (p. 474). The schools of thought on psychological empowerment continue to evolve over time. Thomas and Velthose (1990) extended Conger and Kanunog's model. They claimed that psychological empowerment consisted of four main elements: 1) choice of actions, 2) meaningfulness of the task, 3) competence or self-efficacy, and 4) impact of the task. These four elements positively impact employees in a work environment. Spreitzer (1995) further refined the psychological framework based on the extant literature and developed a multidimensional instrument to assess individual-level psychological empowerment composed of four elements described as 1) meaning, 2) competence, 3) autonomy, and 4) impact.

Spreitzer further defined four related cognitive aspects of the work environment that influence employees' sense of empowerment: 1) meaning, the cognitive belief that their work is important and meaningful; 2) competence, the level of confidence employees have in fulfilling their responsibilities, 3) autonomy, individual control over the initiations and processes of work, and 4) impact, individuals' sense of personal influence on the organization and the belief that their work creates positive outcomes (Spreitzer, 1995). These four cognitive aspects collectively reflect one's orientation to the work environment. Furthermore, they reflect an active rather than passive orientation to one's work role. It is clear that psychological empowerment is related to

one's personal determination, unlike the impact of organizational structure over which employees have little control.

Content of this Dissertation

Chapter One reviews the background of this study and the theoretical framework that guided the design of this study. The background, methods, results, discussions and implications of three aspects of this study are reported in the following three manuscripts:

Chapter Two: The Association of Structural Empowerment and Nurses' Intent to Report Adverse Events (Specific Aim #1).

Chapter Three: The Association of Psychological Empowerment and Nurses Reporting Adverse Events (Specific Aim #2).

Chapter Four: The Association of Nurses' Professional Characteristics and Their Identification and Reporting of Adverse Events (Specific Aim 3a and 3b).

References

Alatawi, Y. M., & Hansen, R. A. (2017). Empirical estimation of under-reporting in the U.S. Food and Drug Administration adverse event reporting system. *Expert Opinion on Drug Safety, 16*(7), 761–767. https://doi.org/10.1080/14740338.2017.1323867

Backstrom, M., Mjorndal, T., & Dahlqvist, R. (2004). Under-reporting of serious adverse drug reactions in Sweden. *Pharmacoepidemiology and Drug Safety, 13*(7), 483–487. https://doi.org/10.1002/pds.962

Brennan, T. A., Herbert, L., Laird, N. M., Lawthers, A., Thorpe, K. E., Leape, L. L., Localio, R., Lipsitz, S. R., Newhouse, J. P., Weiler, P. C., & Hiatt, H. H. (1991). Hospital characteristics associated with adverse events and substandard care. *JAMA, 266*(24), 3265–3269. https://doi.org/10.1001/jama.1991.03460240061028

Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: Integrating theory and practice. *Academy of Management Review*, *13*(3), 471-482. doi:10.5465/amr.1988.4306983

Fassett, W. E. (2006). Patient safety and quality improvement act of 2005. *Annals of Pharmacotherapy, 40*(5), 917–924. https://doi.org/10.1345/aph.1G285

Institute of Medicine (US), Committee on Quality of Health Care in America. (2000). *To err is human: Building a safer health system.* National Academies Press

Kanter, R. M. (1979). Power failure in management circuits. *Harvard Business Review*, *57*(4), 65-75

Kanter, R. M. (1993). *Men and women of the corporation* (2nd ed.). New York: Basic Books.

Laschinger, H. K. S., Finegan, J., Shamian, J., & Casier, S. (2000) Organizational trust and

    empowerment in restructured health care settings: Effects on staff nurse commitment.

    Journal of Nursing Administration, 30(9), 413-425. doi:10.1097/00005110-200009000-

    00008

Leape, L. L., Brennan, T. A., Laird, N., Lawthers, A. G., Localio, A. R., Barnes, B. A., Hebert,

    L., Newhouse, J. P., Weiler, P. C., & Hiatt, H. (1991). The nature of adverse events in

    hospitalized patients: Results of the Harvard Medical Practice Study II. *New England*

    Journal of Medicine, 324(6), 377–384. https://doi.org/10.1056/nejm199102073240605

Leape, L. L., Berwick, D. M., & Bates, D. W. (2002). What practices will most improve safety?

    JAMA, *288*(4), 501–508. https://doi.org/10.1001/jama.288.4.501

Lightdale, J. R., Mahoney, L. B., Fredette, M. E., Valim, C., Wong, S., & DiNardo, J. A. (2009).

    Nurse reports of adverse events during sedation procedures at a pediatric hospital.

    Journal of PeriAnesthesia Nursing, 24(5), 300–306.

    https://doi.org/10.1016/j.jopan.2009.07.004

Mittmann, N., Knowles, S., Gomez, M., Fish, J., Cartotto, R., & Shear N. (2004). Evaluation of

    the extent of under-reporting of serious adverse drug reactions. *Drug Safety*, *27*(7), 477–

    487

Pahuja, S., Puri, V., Mahajan, G., Gupta, P., & Jain, M. (2017). Reporting adverse transfusion

    reactions: A retrospective study from tertiary care hospital from New Delhi, India. *Asian*

    Journal of Transfusion Science, 11(1), 6–12. https://doi.org/10.4103/0973-6247.200779

Spreitzer, G. M. (1995). Psychological empowerment in the workplace—Dimensions,

    measurement, and validation. *Academy of Management Journal, 38*(5), 1442-1465.

    doi:10.2307/256865

Thomas, K. W., & Velthouse, B. A. (1990). Cognitive elements of empowerment. *Academy of Management Review, 15*(4), 666-681. doi:10.5465/amr.1990.4310926

Wagner, L. M., Harkness, K., Hébert, P. C., & Gallagher, T. H. (2012). Nurses' perceptions of error reporting and disclosure in nursing homes. *Journal of Nursing Care Quality, 27*(1), 63–69. https://doi.org/10.1097/NCQ.0b013e318232c0bc

The Association of Structural Empowerment and Nurses' Reporting of Adverse Events.

Loretta Y. So, Mary-Lynn Brecht, Wendie Robbins, Brennan Mason Ross Spiegel, and Carol Pavlish

Abstract

OBJECTIVE: To examine organizational empowerment elements that may be associated with nurses report adverse events voluntarily.

BACKGROUND: Research reveals significant underreporting of adverse events among healthcare providers, including nurses, which results in missed opportunities to reduce medical and system errors to improve patient outcomes.

METHODS: A cross-sectional survey study among nurses in a large academic health system in California. Kanter's described elements (opportunity, information, support, resources, formal power and informal power) of organizational empowerment, measured by the Condition of Work Effectiveness Questionnaire (CWEQ-II) were compared to adverse event reporting.

RESULTS: All CWEQ-II outcomes with exception of access to opportunity showed an overall significant difference between categories of frequencies of the three types of adverse event reported (near-missed incident, events with no potential harm, and events with potential harm but did not).

CONCLUSIONS: Organizational and nursing leaders should construct a supportive environment that fosters adverse event reporting among nurses.

Adverse events resulting from medical errors were first brought to light in the early 1990s.[1] Subsequent studies echoed these findings regarding the medical care in the United States (U.S.) [2] as well as Australia and Canada.[3] A landmark 2000 report from the Institute of Medicine (IOM) estimated that preventable medical errors cause at least 44,000 deaths in the U.S. annually.[4] This report sent shock waves through the U.S. healthcare providers and global healthcare communities. As a result, Congress has allocated $50 million in annual funds for patient safety research.[5]

Since then, there have been many healthcare initiatives to improve care. These include efforts to reduce sepsis with treatment bundles, use of prophylactic antibiotics for surgical patients, and timely administration of anticoagulant agents to improve heart attack and stroke survival rates.[6-8] The IOM recommended confidential, voluntary reporting of error-induced injuries, and in 2005, Congress authorized the creation of a "Patient Safety Organizations Program," a voluntary association of health care entities to promote error reporting.[9] With the mission of promoting better patient outcomes, Patient Safety Organizations (PSOs) aggregate information collected from all medical care providers and conduct activities at medical care facilities to improve patient safety and care delivery processes.

Despite these improvements, evidence suggests that adverse events resulting from medical errors persist.[10,11,12] Evidence shows Medicare recipients are particularly vulnerable , and that adverse events are particularly common at tertiary care hospitals.[13,14] The purpose of this research was to explore the elements of structural empowerment (access to opportunity, information, support, and resources within the organization to complete their work, formal power in job activities and informal power on the organizational relationship scale) that are associated with nurses' reporting of adverse events.

Background

The World Health Organization (WHO) defined a patient safety incident as "an event or occurrence that may cause or causes an interruption or a crisis. A near-miss, it states, is "an event or situation that has the potential to harm a patient but 'that did not reach the patient.'"[16]

The IOM described errors as "the failure of a planned action to be completed as intended (i.e. error of execution) or the use of a wrong plan to achieve an aim (i.e. error of planning)."[15] IOM defined adverse events as "unintended injury to patients caused by medical management (rather than the underlying condition of the patient)" noting, "an adverse event attributable to error is a 'preventable adverse event.'"[15]

The IOM further stated that "although human errors were the most common cause of patient safety incidents, an incident should be seen as a result of a complex system and culture failure, rather than the fault of an individual healthcare provider".[15] One of many efforts to address the challenge of reducing medical errors that may cause patient harm has been to encourage healthcare providers to report adverse events resulting from medical errors. It is critical that such events are reported, so discussion, exploration, and correction of the root causes of medical errors can begin.

Under the 2005 Patient Safety and Quality Improvement Act, each healthcare organization is required to establish an internal reporting system for its staff to document adverse events or near misses.[17] Internal reporting is the first step in providing opportunities for healthcare professionals to examine if adverse events resulted from the breakdown of the established care delivery processes, and to explore opportunities to improve patient care delivery. Furthermore, under this initiative, U.S. federal regulations require healthcare organizations to report adverse events to a Patient Safety Organization (PSO) related to medical errors, starting in

January 2017.[17] The PSO then reviews submitted data to identify significant and preventable adverse events across healthcare facilities, with the goal of sharing such information with other healthcare organizations. Doing so not only brings awareness of the problems, but also prompts other healthcare organizations to examine their own care delivery practices to prevent similar adverse events from happening to patients under care in their own organizations. Furthermore, efforts can be coordinated across the globe to reduce similar, preventable medical errors and to improve care.

However, research studies have identified an alarmingly low adverse event reporting rate,[18,19] raising questions about whether such programs will actually reduce medical errors. For example, these studies identified adverse events underreporting related to non-surgical procedures and sedations and near-miss events in nursing home facilities.[20] Additional studies revealed underreporting of drug-related adverse events in the U.S. and in Sweden.[18,21] Research shows underreporting of adverse drug reactions through the U.S. Food and Drug Administration Adverse Event Reporting System.[22] Indeed, underreporting adverse events is a global issue. Researchers have documented it in the U.S., Australia, Sweden, India, and Canada.[1,2,18,19, 23]

Without information and analysis about adverse events related to medical errors, healthcare organizations and healthcare providers miss opportunities to review and correct systemic issues and to explore human factors that lead to adverse events. Subsequently, these events recur and continue to harm patients, sometimes even fatally.

The WHO stated that focusing on culture, increased adverse event reporting, and learning from errors has been confirmed as one of the most critical areas for patient safety enhancement in hospitals today.[24] National interest in the U.S. has particularly centered on disclosing adverse events as a way to detect institutional improvements to improve patient safety.

Methods

Study Design

This cross-sectional survey study explored how the elements which characterize the structure of a single healthcare organization relate to nurses' intent and willingness to voluntarily report adverse events. Kanter's theory of organizational empowerment guided study design. Kanter described that when individuals gain access to all organizational structural powers, it positively influences their job performance, and that they are highly motivated and perceive an increase in their autonomy.[25] The current research study aimed to explore the association between nurses' perceived formal and informal powers, (i.e. have access to opportunity, information, support and resources) and decisions to report adverse events and expose potential medical errors. The hypothesis was that the perceived empowerment is associated with decision to report adverse events and potential medical errors. The Hospital Survey of Patient Safety Culture (HSOPSC) emphasizes issues related to patient safety and error event reporting. To measure nurses' behavior of reporting adverse events, we analyzed the number of adverse events and the frequency of different types of events (near-missed, event with no harm and event with potential for harm) reported from the HSOPSC survey.

Participant Recruitment

Researchers obtained approval from the Office of the Human Research Protection Program and from the Nursing Research Council at a major academic, tertiary and quaternary referral health system prior to recruitment. With support from the health system's nurse executive and the nursing leadership team, recruitment emails were sent to all nursing staff at the health system from June 9th to July 21st , 2020. Nurses in all roles including staff nurses, nurse educators, and nursing administrators, and various nursing practice roles such as Licensed

Vocational Nurses, Registered Nurses, Advanced Practice Registered Nurse and Certified Registered Nurse Anesthetists were invited to participate. The first recruitment email containing information about the research was sent at the beginning of the data collection period; the next was sent two weeks later, and the third was sent two weeks prior to the closing of the data collection. The researcher also distributed research flyers to all nursing units and answered questions from nurses regarding this research. If interested, participants were instructed to email the principal investigator of this study at the email address provided in the recruitment emails and on the research flyers.

Instruments

Nurses' perceived structural powers were measured by the Conditions for Work Effectiveness (CWEQ-II) questionnaire.[26] The CWEQ-II focuses on upper management's influence on their employees; its focus is organizational conditions.[25] Its six subscales measure if employees believe they have access to 1) opportunity, 2) information, 3) support, and 4) resources within the organization to complete their work, 5) formal power in job activities, and 6) informal power on the organizational relationship scale. The CWEQ-II is a modified version of 31-item CWEQ-I with the addition of the Job Activities Scales (JAS, which measures formal power) and the Organizational Relationship Scale (ORS, which measures informal power). Its six subscales measure employee access to work empowerment structures described in Kanter's theory. The subscales measuring opportunity, information, support, resources, and formal power each consist of three items and the ORS, which measures informal power contains four. Each item is rated on a 5-point scale (ranging from 1 that represents "none" to 5 that signifies "a lot"). The CWEQ-II has a high level of internal consistency, as determined by a Cronbach's alpha of .845.

The nurses' intent of reporting adverse events related to medical errors was measured by the Hospital Survey of Patient Safety Culture (HSOPSC) developed by the AHRQ. Survey development was based on literature reviews, safety culture instruments, and psychometric analyses. The survey developer piloted the draft version in 21 hospitals to refine this instrument and determine its psychometric properties.[27] Based on the analysis, the final survey contains 12 dimensions and 42 items, with additional demographic questions. The final version measures seven unit-level and three hospital-level aspects of safety culture.[27] For this study, from the HSOPSC survey, participants were asked to response to the number of events they reported in 6 categories (No event reported, 1-2, 3-5. 6-10, 11-20, 21 or more), and frequency reports of three types of events (near-missed, events with no potential harm, and events with potential harm but do not) in the most recent 12 months. Items for error frequency use a 5-point response scale, between 1 and 5 and they are: *never* (1), *rarely* (2), *sometimes* (3), *most of the time* (4), *and always* (5). The internal consistency reliabilities for each of the 12 dimensions were identified using the confirmatory factor model. Each of the 12 dimensions was found to have an acceptable reliability, reported as a Cronbach's alpha greater than or equal to .60, with reliability coefficients ranging from .63 to .84.[27]

Both the CWEQ-II and HSOPSC questions were administered through Qualtrics, a secure, HIPAA compliant, online data collection site.

Data Analysis

A one-way ANOVA was used to understand whether there is a difference in the number of adverse events and frequency of reporting three proposed adverse event types based on the CWEQ-II subscales. All assumptions (i.e., absence of outliers, normal distribution of residuals, and homogeneity of variances) were assessed prior to analysis and Boxplot was used to explore

outliers. Outliers were ubiquitous among all analyses. Thus, a comparative analysis approach was utilized. The same data, with and without outliers, were analyzed with one-way ANOVA. However, the outliers were retained because they had no effect on the results. For the results that were statistically significant, post hoc Tukey's HDS method was used to determine which number of event reported group and error frequency groups were significantly different from the others in terms of their CWEQ scores. The Tukey's HDS was the method of choice for the researcher was interested in finding all possible pairwise comparisons and had no prior hypotheses about which and how the number of adverse event reporting groups and the error frequency groups differ from others. Statistical significance was defined as a p-value ≤ 0.05. All analyses were performed in SPSS Version 27.

Results

There were 476 participants who responded to the online questionnaire. Twenty-seven respondents completed 2% or less of the questions and were not included in the analysis, leaving a sample of 449. Ninety-two participants submitted partially completed survey responses. Single imputation using the EM algorithm was applied to impute missing data in those ninety-two responses. All responses were anonymous, but participants specified their credentials and staff positions. The demographic characteristics of participants are displayed in Table 1.

Of the 449 participants' surveys analyzed, 12 participants had submitted 11 to 20 event reports and 2 participants had submitted 21 event reports or more. Due to the small counts in these two categories, they were collapsed into the category of 11 event reports or more. The number of adverse events were then assigned to the following five categories: No event reports (N = 71, 15.8%), 1 to 2 event reports (N = 225, 50.1%), 3 to 5 event reports (N = 113, 25.2%), 6 to 10 event reports (N = 26, 5.8%), and 11 event reports or more (N = 14, 3.1%) (see Table 2).

Table 3 and 4 displayed descriptive analysis of CWEQ-II six subscales, and that of error frequency of three types of adverse event reporting.

Table 5 displays the one-way ANOVA test of variance and the Post Hoc Tukey HSD test of the differences between the CWEQ subscales (six domains of Kanter's structural empowerment) and the five groups of number of adverse event reported and the four error frequency groups (never/rarely, sometimes, most of the time, and always).

There were no significant associations found between the six structural empowerment subscales and the number of adverse events reported. In the near-missed incident category, the analysis revealed that those who *always* reported such incidents have a higher score on their perceived access to information, support, and formal power compared to those who *never/rarely* and *sometimes* reported near-missed events.

Echoing the finding above, those who *always* report adverse events with no potential harm had higher scores on their perceived access to information, support, and formal power than those who *never/rarely* or *sometimes* reported such adverse events. Additionally, those participants who reported adverse events with no potential harm *most of the time* had a higher score in their perceived access to resources than those who reported such events *sometimes*.

The analysis for reported adverse events with potential harm (none resulting) revealed that participants who *always* reported such incidents also had higher scores in their perceived access to all CWEQ-II outcomes with the exception of access to opportunity.

Discussion and Implications

Findings in this study indicate no statistically significant association between the number of incidents that participants reported and any of the CWEQ-II subscales, suggesting perceived access to opportunity, information, support, resources, formal and informal powers do not differ

with nurses' intent to report adverse events. This finding is consistent with results from other studies in neonatal intensive care units, and in medical, surgical, and coronary care intensive care units that reported no significant relationships between number of incidents reported with other patient-safety culture dimensions, such as teamwork, staffing, and communication.[28,29,30] Together with past research studies, the results from our study suggest that the number of adverse events reported by participants may not be an ideal variable for future studies on nurses' structural empowerment to consider.

All CWEQ-II outcomes, with the exception of access to opportunity showed an overall significant difference between the reported frequencies of the three types of adverse events (near-missed, events with no potential harm and events with potential harm but do not) reported by participants. Among all of the subscales in CWEQ-II, perceived access to support consistently had a positive association with nurses reporting all three types of adverse events ($p < .001$): those who *always* report incidents, regardless of their severity (thus including events with and without potential harm), have a higher score on this subscale than those who *never/rarely* and *sometimes* reported such incidents. As Kanter described, access to support can be defined as positive feedback from supervisors, which extends to support from the organization.[31] Nurses, as the managers of patient care, have to interact with multiple healthcare providers and internal departments, and sometimes other healthcare entities to ensure patient management examinations and treatments are provided in efficient and well-organized processes and are executed safely. Nurses' responsibilities also include explaining treatment plans to patients and conducting patient teaching activities which take considerable time. It seems important that nurses have supportive supervisors who will provide clinical expertise as needed and be understanding of significant nursing responsibilities and the time required for daily patient care activities. This

finding resembles research by Hall, which showed that nurses experienced more positive job outcomes with a greater levels of perceived supervisor support.[32] Social support from co-workers also plays an important part in a nurse's daily work.[31] Organizations should provide training to nursing supervisors to promote a healthy, collaborative working environment.[33]

Findings also indicate that access to information could play a role in encouraging nurses to report adverse events in all three categories of incidents described ($p < .01$, $p < .001$,). According to Kanter, employees feel empowered when they have access to information, which allows them to perform their jobs well. It is clear that nurses should receive information that is crucial to patient safety and that will allow efficient delivery of patient care based on medical advances and updated evidence about nursing practice. Healthcare organizations need to provide a robust, easy access electronic information system to provide readily available evidence for safe nursing care, as research suggests readily-available information is an essential element to ensure nursing staff are satisfied with the care they themselves provide.[34]

Among other elements of CWEQ-II, access to resources, as indicated in study findings, might encourage nurses to report near-missed incidents and adverse events with no harm or with harm potential. Participants with higher scores in perceived access to resources *always* reported near-missed (p < .01) and adverse events with potential harm but did not ($p < .05$). On the other hand, participants with higher scores in perceived access to resources reported events with no potential harm *most of the time* rather than *sometimes* ($p < .001$). As Kanter stated, employees feel empowered when they have access to resources, which is defined as access to materials, rewards, and/or financial support. Access to resources are necessary to ensure that employees can function in their organizations effectively.[31] One change that may promote such access is for healthcare organizations to deliver resources to nurses electronically, through platforms such as

email for printing materials, meeting invitations to review new policies, online registration for education opportunities, and webpages with the most updated medical care guidelines, as all of these means have been proven to be effective.[34] Recognition of staff services, in the form of rewards, monetary or otherwise, for accomplishments in the clinical setting, education, and research participation could improve nursing staff morale, signify the organization's appreciation, and may ultimately increase staff's willingness to report adverse events.

The findings indicate that participants with higher score of perceived formal power within the organization will *always* report near-missed events ($p < .001$), events with no potential harm ($p < .001$), and events with potential harm but do not ($p < .05$), while others will report such incidents *never/rarely* or *sometimes*.

The findings also indicate that participants who *always* report adverse events regardless if they are near-missed incidents ($p < .05$), events with no potential harm ($p < .01$), or events with potential harm but do not ($p < .010$) have a higher score of perceived informal power, compared to others who never/rarely report such events

Kanter described that individuals who are granted formal power in an organization are positioned to initiate changes in the process of delivering care.[25] These nurses understand the importance of reporting near-missed and events with no potential harm, so they can formally initiate root-cause analysis to explore the necessary remedies and put the action items in place to prevent the reoccurrence of such incidents. Staff who do not possess formal power in the organization may often overlook these incidents as the event outcomes are considered to be low severity, thus missing the opportunity to improve the system. However, when an event with potential harm occurs, participants with higher mean score in their perceived informal power may see the need to report such events, as those events may have negative impacts on patient

care. These participants may view such incidents as an opportunity for an entire organization to learn lessons and share the process of improvement efforts with their peers, subordinates, and other work groups within and outside the organization.

Limitations

This is a cross-sectional survey study, and thus it is impossible to make causal claims. However, the use of theory-driven hypotheses offsets this limitation to some extent. The recruited research participant group was based on a convenience sample from a single academic, tertiary and quaternary referral medical center, which has its unique organization structures. Thus, findings cannot be generalized to nurses working in other medical centers, community hospitals, rural areas, ambulatory settings, or home health settings. This study also involved self-reports of number and frequency of adverse event types which could result in response bias and affect results. In addition, participants' age, experience, ethnicity, and education level may affect their interpretation of the meaning of "power," which is often viewed through a sociocultural lens.

This survey study's implementation was delayed from March of 2020 due to the COVID-19 pandemic crisis. The medical center had to implement operational changes before the researcher could recruit participants. Research indicates that the pandemic crisis increased nurses' report of stress associated with family separation, lack of quality sleep, and added workloads related to the rapidly changing health agencies guidelines.[35] Nurses have also described experiencing stress due to the lack of planning at the hospital management, state and federal government levels, particularly pertaining to personal protection equipment for staff.[35] These conditions may have influenced participants' responses while they were experiencing and working through these stressful environments. With the approval from the Institutional Review

Board at the participating medical system, the data collection period was extended from 4 weeks to 6 weeks to enhance recruitment of participants. The power analysis revealed a sample size of 216 would be required to achieve a power of 0.8, and research sample ultimately consisted of 449 participants.

Summary and Conclusions

The purpose of this study was to investigate the relationship between organizational empowerment elements and nurse' intent to report adverse events, including near-misses and adverse events that either with or without potential harm. Results did not suggest significant association between the number of adverse events reported by nurses with any of the subscales in the CWEQ-II survey questionnaire. These findings warrant further explorations of the applicability of these variables to measure the conditions that will support nurses in reporting adverse events.

All CWEQ-II questionnaire outcomes except access to opportunity correlated with different levels of frequency of reporting adverse events. As Kanter explained, the structure of opportunity can be defined as employees' access to learn new skills and ability to recognize opportunities to improve themselves and subsequently advance their careers.[31] As the findings of this research suggested, pertaining to adverse event reporting, nurses were not affected by a drive to advance their careers. In contrast, the findings suggested that participants would *always* report adverse events, regardless of whether the events are with or without potential harm when they have higher scores in their perception of having access to all other subscales within structural empowerment. The degrees of influence among these subscales reported a slight difference in participants' mean scores of their perceived access to other measures, while participants reported higher access to information demonstrated higher degree of significant

difference from other subscales. These findings suggest that providing nurses with information could have positive influence on nurses to report adverse events. Healthcare administrators and nursing leadership should provide and promote education programs, nursing grand-round, and patient safety promotion campaigns to ensure information is readily available, resources are constantly updated. Healthcare organization leadership can cultivate a supportive environment, to be established and encouraged from high level nursing leadership to unit nursing directors to front-line nursing staff. Townhall, regular meeting sessions with an open, welcoming atmosphere to encourage dialogue between front-line nursing staff and nursing leadership can provide a forum for discussing concerns, sharing challenges encountered, and exchanging ideas aiming for collective resolutions.

Adverse event reporting is a multifactorial, complex issue and cannot be solved by nursing professionals alone. Improving reporting will require collective efforts from various professions, within and outside healthcare organizations in the pursuit of safe and high quality care delivery. The U.S. Bureau of Labor Statistics reported that registered nurses were the largest occupational group in U.S. hospitals in May 2019, with over 1.8 million employed, which was about 30 percent of total hospital employment.[37] Nurses can and should play a leading role in adverse event reporting among all medical care professionals, as in the U.S., public interest has recently become focused on adverse event reporting as a way of prompting institutional improvements to improve patient safety.

References

1. Leape LL, Brennan TA, Laird N, et al. The nature of adverse events in hospitalized-patients-results of the Harvard Medical-Practice Study II. N Engl J Med. 1991;324(6):377-384. doi:10.1056/nejm199102073240605.

2. Brennan TA, Leape LL, Laird NM, et al. Incidence of adverse events and negligence in hospitalized patients: Results of the Harvard Medical Practice Study I. Ne Engl J Med. 324: 370-376, 1991. See also: Thomas EJ, Studdert DM, Burstin HR, et al. Incidence and types of adverse events and negligent care in Utah and Colorado. Med. Care. 2000;38(3):261-271. doi:10.1097/00005650-200003000-00003.

3. Baker GR, Norton PG, Flintoft V, et al. The Canadian adverse events study: the incidence of adverse events among hospital patients in Canada. JAMA. 2004;170(11):1678-1686. doi:10.1503/cmaj.1040498.

4. Institute of Medicine (US) Committee on Quality of Health Care in America; Kohn, LT, Corrigan, JM, Donaldson, MS, editors. To Err is Human: Building a Safer Health System. Washington (DC): National Academies Press (US); 2000. 6, Protecting Voluntary Reporting Systems from Legal Discovery. https://www.ncbi.nlm.nih.gov/books/NBK225185/

5. Leape LL, Berwick DM, Bates DW. What practices will most improve safety? JAMA. 2002;288(4):501-508. doi:10.1001/jama.288.4.501.

6. Dellinger RP, Levy MM, Rhodes A, et al. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock, 2012. Intensive Care Med. 2013;39(2):165-228. doi:10.1007/s00134-012-2769-8.

7. Salkind AR, Rao KC. Antibiotic prophylaxis to prevent surgical site infections. Am Fam Physician. 2011;83(5):585-590.

8. Van Hom SE, Maniu CV. Management of non-ST-segment elevation myocardial infarction. Med Clin North Am. 2007;91(4):683-700; xi. doi:10.1016/j.mcna.2007.02.008.

9. Fassett WE. Patient safety and quality improvement act of 2005. Ann Pharmacother. 2006;40(5):917-924. https://doi.org/10.1345/aph.1G285.

10. Baines RJ, Langelaan M, De Bruijne MC, et al. Changes in adverse event rates in hospitals over time: A longitudinal retrospective patient record review study. BMJ Quality and Safety. 2013;22(4):290-298. doi:10.1136/bmjqs-2012-001126.

11. Landrigan CP, Parry GJ, Bones CB, et al. Temporal trends in rates of patient harm resulting from medical care. N Engl J Med. 2010;363(22):2124-2134. doi:10.1056/NEJMsa1004404.

12. Makary MA, Daniel M. Medical error-the third leading cause of death in the US. BMJ. 2016;353:i2139. doi:10.1136/bmj.i2139.

13. Resar RK, Rozich JD, Simmonds T, Haraden CR. A trigger tool to identify adverse events in the intensive care unit. Jt Comm J Qual Patient Saf. 2006;32(10):585-590. doi:10.1016/S1553-7250(06)32076-4.

14. Classen DC, Resar R, Griffin F, et al. Global trigger tool shows that adverse events in hospitals may be ten times greater than previously measured. Health Aff. 2011;30(4):581-589. doi:10.1377/hlthaff.2011.0190.

15. Institute of Medicine (US) Committee on Quality of Health Care in America. To Err is Human: Building a Safer Health System. Washington, DC: National Academies Press; 2000.

16. World Health Organization. Definitions of Key Concepts from the WHO Patient Safety Curriculum Guide (2011). 2012. http://www.who.int/patientsafety/education/curriculum/course1a_handout.pdf. Accessed March 16, 2018.

17. Department of Health and Human Services. Patient Safety and Quality Improvement: Proposed rule. February 12, 2008. https://pso.ahrq.gov/sites/default/files/NPRM.pdf. Accessed May 16, 2019.

18. Backstrom M, Mjorndal T, Dahlqvist R. Under-reporting of serious adverse drug reactions in Sweden. Pharmacoepidemiol Drug Saf. 2004;13(7):483-487. doi:10.1002/pds.962.

19. Lightdale JR, Mahoney LB, Fredette ME, et al. Nurse reports of adverse events during sedation procedures at a pediatric hospital. J PeriAnesth Nurs. 2009;24(5):300-306. doi:10.1016/j.jopan.2009.07.004.

20. Wagner LM, Harkness K, Hébert PC, Gallagher TH. Nurses' perceptions of error reporting and disclosure in nursing homes. J Nurs Care Qual. 2012;27(1):63-69. doi:10.1097/NCQ.0b013e318232c0bc.

21. Mittmann N, Knowles S, Gomez M, Fish J, Cartotto R, Shear N. Evaluation of the Extent of Under-Reporting of Serious Adverse Drug Reactions. Drug Saf. 2004;27(7):477-487.

22. Alatawi YM, Hansen RA. Empirical estimation of under-reporting in the U.S. Food and Drug Administration adverse event reporting system. Expert Opin Drug Saf. 2017;16(7):761-767. doi:10.1080/14740338.2017.1323867.

23. Pahuja S, Puri V, Mahajan G, Gupta P, Jain M. Reporting adverse transfusion reactions: A retrospective study from tertiary care hospital from New Delhi, India. AJTS. 2017;11(1):6-12. doi: 10.4103/0973-6247.200779.

24. World Health Organization (WHO). Conceptual Framework for International Classification for Patient Safety. 2009.http://www.who.int/patientsafety/taxonomy/icps_full_report.pdf. Accessed March 16, 2018.

25. Kanter RM. Power failure in management circuits. HarvBus Rev. 1979;57(4):65-75.

26. Laschinger HKS, Finegan J, Shamina J, Wilk P. (2001). Impact of structural and psychological empowerment on job strain in nursing work settings: Expanding Kanter's model. Journal of Nursing Administration, 31(5), 260-272.

27. Sorras JS, Nieva VF. Hospital Survey on Patient Safety Culture (AHRQ Publication No. 04-0041). Rockville, MD: Agency for Healthcare Research and Quality; 2004.

28. Snijders C, Kollen B, Van Lingen R, Fetter W, Molendiji H. Which aspects of safety culture predict incident reporting behavior in neonatal intensive care units? A multilevel analysis. Crit Care Med. 2009;37(1):61-67. doi:10.1097/CCM.0b013e31819300e4.

29. Ballangrud R, Hedelin B, Hall-Lord ML. Nurses' perceptions of patient safety climate in intensive care units: A cross-sectional study. Intensive Crit Care Nurs. 2012;28(6):344-354. doi:10.1016/j.iccn.2012.01.001.

30. Kanter RM. Men and Women of the Corporation. 2nd ed. New York: Basic Books; 1993.

31. Huang, D. T., Clermont, G., Sexton, B., Karlo, C. A., Miller R., Weissfeld, L., … Angus, D. (2007). Perceptions of safety culture vary across the intensive care units of a single institution. *Critical Care Medicine, 35*(1), 165-176. doi:10.1097/01.CCM.0000251505.76026.CF

32. Hall DS. The relationship between supervisor support and registered nurse outcomes in nursing care units. Nurs Admin. 2007;31(1):68-80.

33. Dehghan Khadijeh, Nasirian K, Salimi Tahere. Requirements for nurse supervisor training: A qualitative content analysis. Irna J Nurs Midwifery Res. 2016;21(1):63-70. doi:10.4103/1735-9066.174760.

34. Rouleau G, Gagnon M, Cote J, Payne-Gagnon J, Hudson E, Dubois C. Impact of information and communication technologies on nursing care: Results of an overview of systematic reviews. J Med Internet Res. 2017;19(4): e122. doi:10.2196/jmir.6686.

35. Huang L, Rong Liu H. Emotional responses and coping strategies of nurses and nursing college students during COVID-19 outbreak. PubMed. 2020. https://pubmed.ncbi.nlm.nih.gov/32764825/.

36. Lam S, Kwong E, Hung M, Chien W. Emergency nurses' perceptions regarding the risks appraisal of the threat of the emerging infectious disease situation in emergency departments. QHW2020;15:1, e1718468. doi:10.1080/17482631.2020.1718468.

37. U.S. Bureau of Labor Statistics. TED: The Economic Daily. https://www.bls.gov/opub/ted/2020/registered-nurse-made-up-30-percent-of-hospital-employment-in-may-2019.htm. Accessed October 17, 2020.

Table 1. Demographic characteristics of participants

Variable		N	Percentage
Gender			
Female		397	88.4
Male		52	11.6
Ethnicity			
Hispanic or Latino		68	15.1
Not Hispanic or Latino		381	84.9
Age			
Range	24 - 68		
Mean	42.9		
Median	42		
Education			
High School		6	1.3
Some college, no degree		9	2.0
Associate degree		31	6.9
Bachelor's degree		282	62.8
Graduate degree		121	27.0
Years in nursing profession			
Less than 1 year		15	3.3
1 – 5 years		105	23.4
6 – 10 years		98	21.8
11 – 15 years		109	24.3
16 – 20 years		42	9.4
21 years or more		80	17.8
Certified Nurse			
Yes		359	80.0
No		90	20.0
Professional Membership			
Yes		345	76.8
No		104	23.2
Nursing Practice			
LVN		20	4.5
RN		386	87.5
APRN		15	3.4
CRNA		20	4.5
Current Work Role			
Staff Nurse		393	87.5
Nurse Educator		18	4.0
Management/Administrator		38	8.5
Employment Status			
Full-time		388	86.4
Part-time		61	13.6
Work hours per week			
Less than 20 hours		18	4.0
20 – 39 hours		264	58.8
40 – 59 hours		155	34.5
60 – 79 hours		12	2.7

Table 2: Observed number of participants in each categories of number of adverse events reported and in each of the three types of adverse events.

Adverse Events	No	1-2	3-5	6-10	11 or more	Never/ Rarely	Some times	Most of the time	Always
AE # Reported	71 (15.8)	225 (50.1)	113 (25.2)	26 (5.8)	14 (3.1)				
Near-Missed Events Reported						58 (12.9)	98 (21.8)	213 (47.4)	80 (17.8)
No Potential Harm Reported						60 (13.4)	103 (22.9)	208 (46.3)	78 (17.4)
With potential harm but does not						20 (4.5)	74 (16.5)	223 (49.7)	132 (29.4)

Note. Percentage of participant in parentheses underneath observed frequency.

Table 3: Tables of Descriptive Statistic of CWEQ-II subscales
(For each of the subscale, N = 449)

CWEQ-II Subscales	Mean	Std. Deviation
Access to Opportunity	4.08	.74
Access to Information	3.39	.18
Access to Support	3.47	.99
Access to Resource	3.51	.84
Formal Power (JAS)	3.24	.87
Informal Power (ORS)	3.62	.79

Note: Minimum = 1.00 for each of the subscale
Maximum = 5.00 for each of the subscale

Table 4: Descriptive Statistics of CWEQ-II Subscales by Frequency of three types of adverse event reporting

CWEQ_II Subscale	Frequency	Near-Missed			No Potential Harm			With Potential Harm but does not		
		N	Mean	SD	N	Mean	SD	N	Mean	SD
Access to Opportunity	Never/Rarely	58	3.89	.92	60	3.92	.81	20	3.87	.83
	Sometimes	98	4.17	.68	103	4.04	.76	74	4.06	.77
	Most of the time	213	4.06	.67	208	4.12	.69	223	4.05	.68
	Always	80	4.18	.80	78	4.17	.75	132	4.19	.80
Access to Information	Never/Rarely	58	3.14	.97	60	3.08	.87	20	3.12	1.07
	Sometimes	98	3.24	.88	103	3.34	.87	74	3.21	.83
	Most of the time	213	3.38	.84	208	3.37	.86	223	3.33	.81
	Always	80	3.79	.97	78	3.75	.99	132	3.63	1.02
Access to Support	Never/Rarely	58	3.05	.94	60	3.12	.93	20	3.11	.89
	Sometimes	98	3.28	.90	103	3.28	.96	74	3.20	.91
	Most of the time	213	3.54	.88	208	3.53	.88	223	3.44	.89
	Always	80	3.81	.98	78	3.81	.93	132	3.71	.99
Access to Resource	Never/Rarely	58	3.36	.87	60	3.29	.79	20	3.22	.79
	Sometimes	98	3.34	.38	103	3.31	.81	74	3.35	.88
	Most of the time	213	3.53	.79	208	3.57	.81	223	3.48	.82
	Always	80	3.70	.90	78	3.74	.89	132	3.67	.83
Job Activity Scale (Formal Power)	Never/Rarely	58	2.97	.87	60	2.92	.81	20	2.95	.80
	Sometimes	98	3.03	.82	103	3.11	.78	74	3.07	.87
	Most of the time	213	3.32	.78	208	3.31	.80	223	3.24	.77
	Always	80	3.50	1.04	78	3.50	1.07	132	3.39	.99
Organizational Relationships Scale (Informal Power)	Never/Rarely	58	3.36	.97	60	3.45	.55	20	3.25	.89
	Sometimes	98	3.55	.67	103	3.48	.74	74	3.51	.80
	Most of the time	213	3.67	.75	208	3.65	.77	223	3.598	.76
	Always	80	3.77	.67	78	3.85	.83	132	3.778	.81
Total Structural Empowerment Score (Six Subscale Version)	Never/Rarely	58	19.76	4.16	60	19.78	3.66	20	19.517	4.27
	Sometimes	98	20.62	3.49	103	20.56	3.52	74	20.40	3.56
	Most of the time	213	21.49	3.85	208	21.56	3.71	223	21.145	3.52
	Always	80	22.79	4.23	78	22.83	4.08	132	22.37	4.15

Table 5. ANOVA Results and Post hoc Tukey HSD test comparing number of adverse events reported, frequency of types of adverse events reported and CWEQ-II subscales

Adverse Events	CWEQ-II subscale	$F(\eta^2)$	P-value	Significant post-hoc comparison
Number of adverse events reported	Opportunity	0.89 (.01)	.473	n/a
	Information	1.17 (.01)	.326	n/a
	Support	0.38 (.00)	.825	n/a
	Resources	1.78 (.02)	.133	n/a
	JAS	0.21 (.00)	.933	n/a
	ORS	0.81 (.01)	.518	n/a
Near-missed incident reported	Opportunity	2.29 (.02)	.078	n/a
	Information	7.72 (.05)	**< .001**	Always > never/rarely, sometimes, most of the time
	Support	9.69 (.06)	**< .001**	Always and most of the time > never/rarely
				Always > sometimes
	Resources	4.25 (.03)	**.006**	Always > never/rarely and sometimes
	JAS	7.18 (.05)	**< .001**	Always and most of the time > never/rarely
				Always and most of the time > sometimes
	ORS	3.54 (.02)	**.015**	Always > never/rarely
Adverse event with no potential harm reported	Opportunity	1.64 (.01)	.181	n/a
	Information	6.90 (.04)	**< .001**	Always > never/rarely, sometimes, most of the time
	Support	8.38 (.05)	**< .001**	Always and most of the time > never/rarely
				Always and most of the time > sometimes
	Resources	5.80 (.04)	**.001**	Always > never/rarely, sometimes
				Most of the time > sometimes
	JAS	6.67 (.04)	**< .001**	Always and most of the time > never/rarely
				Always > sometimes
	ORS	4.32 (.03)	**.005**	Always > never/rarely and most of the time
Adverse event with potential harm but do not reported	Opportunity	1.75 (.01)	.156	n/a
	Information	5.17 (.03)	**.002**	Always > sometimes and most of the time
	Support	6.24 (.04)	**< .001**	Always > never/rarely, sometimes, most of the time
	Resources	3.29 (.02)	**.021**	Always > sometimes
	JAS	3.13 (.02)	**.026**	Always > sometimes
	ORS	3.79 (.03)	**.010**	Always > never/rarely

The Association of Psychological Empowerment and Nurses' Reporting Adverse Events.

Loretta Y. So, Mary-Lynn Brecht, Wendie Robbins, Brennan Mason Ross Spiegel, and Carol Pavlish

Abstract:

Healthcare's efforts to prevent adverse events include initiatives to encourage adverse event reporting so it becomes possible to explore causes and prevent recurrence. However, research reveals significant underreporting of adverse events among healthcare providers, including nurse professionals. The aim of this cross-sectional survey study among nurses in a large academic health system in California was to examine the psychological empowerment elements that may influence nurses' intent to report adverse events. Findings show that in general, nurses who score higher in total psychological empowerment tend to report adverse events more often than those with lower scores regardless of event severity (near-missed, event with no potential harm or event could harm but does not). Organizational and nursing leaders should cultivate a supportive environment, tailored to promoting psychological elements that prompt nurses to report adverse events. This will enable healthcare organizations to explore causes, broaden discussions, and share solutions about preventing adverse events.

Keywords:

Psychological empowerment, adverse event reporting, nurses, patient safety, patient harm

Points for Practitioners:

1. Nurses who score higher in total psychological empowerment are more often to report adverse events (near-missed, event with no potential harm, or event could harm but does not) regardless of severity.

2. Among the elements of psychological empowerment measured with the psychological empowerment questionnaire (PEQ), "impact" is the only one that is consistently associated with frequency of reporting the three types of adverse events.

The United States first began to recognize the magnitude of adverse events occurring among hospitalized patients in the late 1990s. A report indicated that adverse events occurred in 3.7% of hospitalizations in New York State, of which more than half were considered preventable medical errors (Leape et al., 1991). Researchers in Utah and Colorado revealed 2.89% of hospitalizations were associated with adverse events (Brennen et al., 1991). A report by the Institute of Medicine (IOM), "*To Err Is Human*," estimated preventable medical errors caused the death of between 44,000 and 98,000 in the United States annually (IOM, 2000). Other countries also began to identify the problem as well. Canadian researchers identified that among 2.5 million annual hospital admissions, over 185,000 adverse events were identified, and of those, 70,000 adverse events were potentially preventable (Baker et al., 2004).

The findings of these reports showed that adverse events affected all kinds of services, sending a shockwave through the healthcare industry around the globe. Researchers found, for example, that medical errors were often associated with surgery; such events account for 30-50% of reported adverse events (Brennan et al., 2004; Leape et al., 1991). Among non-surgical adverse events, the largest category was generally drug-related incidents (Alatawi & Hansen, 2017), with others such as diagnostic tests and medical procedures, anesthesia, and system issues following (Brennan et al., 2004; Leape et al., 1991; Thomas et al., 2000). Adverse events also have been associated with bedside moderate sedation documented by registered nurses (Lightdale et al., 2009). Anesthesiologists have reported adverse events with patients undergoing anesthesia care (Heard et al., 2012). Patients in intensive care units are at high risk of adverse events (Leape et al., 1991; Brennan et al., 2004), but studies show adverse events also occur in emergency rooms (Hobgood et al., 2006) and through radiology services (Brenner & Bartholomew, 2005; Waite et al., 2018).

In "*To Err Is Human*," the IOM called on all healthcare professionals, hospital leaderships, and the federal government to prioritize patient safety improvements nationally. Since then the industry has instituted many healthcare initiatives, such as efforts to reduce sepsis with sepsis treatment bundles (Dellinger et al., 2013), appropriate use of prophylactic antibiotics for surgical patients (Salkind & Rao, 2011), and timely administration of anticoagulant agents to improve heart attack and stroke survival rates (Van Hom & Maniu, 2007).

Despite ongoing efforts to improve care and reduce adverse events resulting from medical errors, they have continued (Baines et al., 2013; Landrigan et al, 2010). Recent research indicates adverse events has been reported among the top leading causes of death in 2013 (Makary & Daniel, 2016)

One of many efforts to address the challenge of reducing medical errors that may cause patient harm has been to encourage healthcare providers to report adverse events resulting from medical errors. IOM recommended voluntary adverse event reporting within a healthcare organization, so causes can be explored, and mistakes can be corrected to prevent occurrence of similar adverse events. The recommendation from IOM also prompted Congress to appropriate an annual budget of $50 million for patient safety initiatives under the Patient Safety and Quality Act 2005 (Department of Health and Human Services, 2008). Congress further authorized the creation of a nationwide "Patient Safety Organization" (PSO) program, which was implemented in 2017 to promote adverse events reporting across the nation (Department of Health and Human Services, 2008). Patient Safety Organizations (PSOs) aggregate information collected from medical care providers, facilitate patient safety activities at medical care facilities, and share such information among healthcare systems and practitioners.

However, adverse event reporting rates remain alarmingly low, both in the United States (U.S.) and globally (Backstrom et al., 2004; Lightdale et al., 2009). For example, underreporting of adverse events is a problem in nursing home facilities (Wagner et al., 2012), drug-related adverse events in both the U.S. (Mittmann et al., 2004) and Sweden (Backstrom et al., 2004). Recent publications continue to identify underreporting of adverse drug reactions through the U.S. Food and Drug Administration Adverse Event Reporting System (Alatawi & Hansen, 2017), and underreporting of blood transfusion reactions in India (Pahuja et al., 2017). Adverse event underreporting is a vital topic for research. This study explored the relationship between nurses' psychological empowerment and nurses' reporting of adverse event.

Background

A culture of blame in a healthcare institution when errors happen, particularly those that are associated with negative or harmful patient outcomes, plays a role in discouraging nurses to report adverse events. Evidence from a multinational study revealed that a blaming culture was reported as one of the top barriers for reporting patient safety events (Holmstrom et al., 2010). Nurses often report that their institutions blame individual care providers instead of faulty systems, processes, or technologies (Bayazidi et al., 2012; Clancy, 2012; Cook et al., 2004; Uribe et al., 2002). The perceived lack of support from unit-level supervisors and high-level administrators posed negative impact on nurses' intent to report adverse events (Cook et al., 2004; Prang & Jelsness-Jorgensen, 2014; Stratton et al., 2004). A study in Greece found nurses did not report adverse events because they believed the process was cumbersome and because they feared unwanted attention from the public (Moumtzoglou, 2010).

Nurses are less likely to report medical errors if they fear suffering personal repercussions. Nurses indicate they fear that their employer will punish them, patients may have

a negative attitude, and the healthcare organization might suffer negative publicity if they report safety deficiencies or their concerns about colleagues' competence (Bayazidi et al., 2012; Castel et al., 2015; Cook et al., 2004; Hartnell et al., 2012; Jeffe et al., 2004; Stratton et al., 2004). They also fear diminishing the public's confidence in their work (Jeffe et al., 2004), exposure to malpractice suits (Hartnell et al., 2012), and even losing their license to practice (Stratton et al., 2004). Nurses' concerns over implicating other colleagues, receiving no support from the healthcare organization, lacking time to report, and being uncertain about the benefits of reporting errors also depress adverse event reporting (Davidson et al., 2015; Jeffe et al., 2004; Stratton et al., 2004; Taylor et al., 2004; Uribe et al., 2002). Nurses expressed experiencing exacerbated stress from their involvement in an adverse event when there was lack of strategic assistance from their health institution (Koehn, Ebright, & Draucker; 2016). Concerns about negative emotional impacts such as anxiety, sleeping problems, loss of confidence and decreased work satisfaction have impacted reporting (O'Berirne et al., 2012; Waterman et al, 2007).

This current study focused on psychological factors that may be associated with nurses' reporting of adverse events. The psychological factors included how nurses perceive their level of competence to perform work activities, their beliefs of their work are meaningful, their sense of autonomy over having choices to initiate actions and the degree to which they view their work are impactful.

Methods

Theoretical Framework

The design of the study is guided by the theory of psychological empowerment, of which the central tenet is employees' beliefs about control over their work plays a significant role in their behavior. Conger and Kanungo (1988) viewed psychological empowerment as one of the

building blocks for motivation. These researchers indicated that employees should be provided

an environment that will enable them to do good work, instead of one that requires them to take

up a task through delegation or as an assignment. Organizations and supervisors should identify

conditions that make subordinates feel powerless and remove those identified conditions to

establish organizational practices and provide employees with information that will enhance their

feeling of efficacy.

Extending Conger and Kanunog's model, Thomas and Velthose (1990) identified four

main elements of psychological empowerment: 1) choice of actions, 2) meaningfulness of the

task, 3) competence or self-efficacy, and 4) impact of the task. Spreitzer (1995) further defined

four aspects of the work environment that influence psychological empowerment: 1) meaning,

the cognitive belief that work is important and meaningful; 2) competence, the level of

confidence employees has in fulfilling their responsibilities, 3) autonomy, individual control over

the initiations and processes of work, and 4) impact, individuals' sense of personal influence on

the organization and the belief that their work creates positive outcomes. These four cognitive

aspects collectively reflect one's orientation to the work environment. Employees that have

these cognitive characteristics will have an active rather than passive orientation to their work

role. Psychological empowerment is related to individuals' personal determination, unlike the

impact of organizational structure over which employees have little control.

Study Design

This was a cross-sectional survey study that sought to investigate the relationship

between psychological empowerment elements and nurses reporting adverse events voluntarily.

The following research questions guided this study:

1. Does psychological empowerment associate with the number of adverse event nurses report in the prior twelve months?

2. Is psychological empowerment related to the perception of how frequently nurses report adverse event according to the outcomes of the event (near-missed, event with no potential harm, and event with potential harm but does not.)?

Participant Recruitment

The institutional setting's internal review board at the Office of the Human Research Protection Program reviewed and approved the study and all recruitment communications. The nursing executive and Nursing Research Council of a major academic, tertiary and quaternary referral health system approved all data collection activities and supported the research effort. Between June 9th and July 31st , 2020, all nursing staff (staff nurses, nurse educators, certified registered nurse anesthetics, and nurse administrators) at the health system received a total of four recruitment emails that contained a link to the online questionnaire on June 9th , June 23rd , July 7th , and July 21st . The researcher also distributed research flyers to all nursing units in the healthcare system and answered nurses' questions in person and on email.

Among the 476 participants who responded to recruitment efforts in this study, 27 did not answer any questions, so they were not included in the data analysis processes leaving a sample of 449. Single imputation using the EM algorithm was applied to impute missing data on the 92 survey responses with some missing data (Cokluk & Kayri, 2011). Responses were anonymous, but participants specified their credentials and staff positions.

Data Collection Instruments

Spreitzer's Psychological Empowerment Instrument (PEQ) is a 12-item scale with three items for each of the four dimensions:

1) *Meaning* refers to the fit between individuals' work goal and their beliefs or values.

2) *Competence* refers to individuals' belief in their capability to skillfully perform work activities.

3) *Self-determination* refers to an individual's sense of control over having choice initiating and regulating actions, reflecting his or her sense of autonomy.

4) *Impact* refers to the degree to which an individual views his or her capability to influence strategic, administrative, or operating outcomes at work, to the extent of making a difference.

Psychological empowerment is related to one's personal determination, and the work environment affects it (Spreitzer, 1995). Together, these dimensions capture a complex focus towards work, and psychological empowerment is the greatest when all four dimensions are high (Spreitzer, 1995). Each item is rated on a 7-point Likert scale (1= strongly disagree to 7 = strongly agree). The subscale score is the sum of items on each subscale, ranging from 3 to 21. The total score is the average of subscale scores, ranging from 3 to 21. Higher scores indicate higher perception of empowerment.

The Hospital Survey of Patient Safety Culture (HSOPSC) developed by the Agency for Healthcare Research and Quality (AHRQ) was used to measure nurses' intent to report adverse events. The complete HSOPSC survey contains 42 items, together with background questions to examine 12 patient safety culture composites. HSOPSC measures both unit-level and hospital-level aspects of safety culture. This study used variables from the HSOPSC survey: 1) the overall number of events reported in the past 12 months and 2) three questions measuring the frequency (never/ rarely, sometimes, most of the times, and always) of three different types of events reported (near-miss, event with no potential for harm, and event with potential for harm

but does not).

Data Analysis

Psychological empowerment questionnaire (PEQ) measures were analyzed by subscale (meaning, competence, self-determination, and impact) and by the total score calculated by the average of the subscale scores. The PEQ has a high level of internal consistency, as determined by a Cronbach's alpha of 0.802.

HSOPSC measures were analyzed by number of event reports filled out and submitted by participants in the most recent 12 months at the time respondents participated in this survey study in 6 categories (no event reported, 1-2, 3-5. 6-10, 11-20, 21 or more), and types of events (event caught before reaching patient, no potential for harm event, and event could harm but does not)

Of the 449 participants, 12 submitted 11 to 20 event reports and 2 submitted 21 event reports or more. Due to the small counts in these two categories, they were collapsed into the category of 11 event reports or more. Thus responses were categorized as follows: No event reports (N = 71, 15.8%), 1-2 event reports (N = 225, 50.1%), 3- 5 event reports (N = 113, 25.2%), 6- 10 event reports (N = 26, 5.8%), and 11 event reports or more (N = 14, 3.1%) (see Table 2).

Statistical significance was defined as a p-value ≤ 0.05. All analyses were performed in IBM SPSS (Statistical Package for the Social Sciences) Version 27. (SPSS Inc., Chicago, IL, USA.)

A one-way ANOVA was used to understand whether there is a difference in the number of adverse events and frequency of reporting three categories of adverse events (near-missed, event with no potential harm, event could harm but does not) in terms of the PEQ subscales. All

assumptions (i.e., absence of outliers, normal distribution of residuals, and homogeneity of variances) were assessed, and Boxplot showed outliers were ubiquitous among all analyses. Thus a comparative analysis approach was utilized. The same set of data, with and without outliers, were analyzed with one-way ANOVA, followed by a nonparametric test. However, the outliers were retained because they had no effect on the results. For the results that were statistically significant, post hoc Tukey's HDS method was used to determine which group of number of event reported and error frequency groups were significantly different from the others in terms of their PEQ scores. The Tukey's HDS was the method of choice for the researcher was interested in finding all possible pairwise comparisons and had no prior hypotheses about which and how the number of adverse event reporting groups and the error frequency groups differ from others.

Study Results

There were 449 total respondents included in this study. Table 1 presents the demographic characteristics of the participants. The majority of the sample were female (88.4%) and not Hispanic or Latinx (84.9%). Participants represented a range of ages (24-68) with a mean age of 42.9 years. The majority were Registered Nurses (87.5%) who work as staff nurses (87.5%). Table 3 and 4 displayed descriptive analysis of PEQ subscales, and that of error frequency of three types of adverse event reporting.

Table 5 displays the one-way ANOVA test of variance and the Post Hoc Tukey HSD test of the differences between the PEQ subscales and the five groups of number of adverse event reported and the four error frequency groups (never/rarely, sometimes, most of the time, and always). Results show that there were no significant associations found between the PEQ subscales and the five groups of number of adverse events reported.

While "impact" ($p \leq .000$) and "total psychological empowerment" ($p \leq .004$) were found to have significant difference between the categories of error reporting frequency (always, most of the time, sometimes, and rarely/never) of "near-missed" events reported (Table 5), the post hoc test determined that those who *always* report such event had a higher mean score on the "impact" subscale and their total psychological empowerment scale than those who *sometimes* or *never/rarely* report (Table 5). Additionally, those who report such events *most of the time*, had a higher mean score on the "impact" subscale than those who *never/rarely* report such events (Table 4).

Among the frequency categories for reporting "events with no potential for harm", there were significant differences for "total psychological empowerment" ($p \leq .001$) as well as three of the psychological empowerment outcomes: meaning ($p \leq .010$), competence ($p \leq .007$) and impact ($p \leq .000$) (see Table 5). For the "meaning" and "competence" subscales, those who *always* report such events have a higher mean score than those who *sometimes* report (Table 5). For the "impact" subscale, those who *always* report such events have a higher mean score than those who report *never/rarely, sometimes*, and *most of the time* (Table 5). As for the overall psychological empowerment, those who always report such events have a higher score than those who *sometimes* or *never/rarely* report (Table 5).

Once again, when compared to the findings of the responses to the "near-missed" events, "impact" ($p < .001$) and "total psychological empowerment" ($p < .007$) were found to have significant differences between the categories of frequency of reporting "event could have harm but does not" (Table 5). Those who *always* report such events have a higher mean score on the "impact" subscale than those who *most of the time*, *sometimes*, and *never/rarely* report (Table 5).

Those who *always* report such events have a higher score on the "total psychological empowerment" scale than those who *sometimes* report such events (Table 5).

Discussion and Implications

Study findings indicate no statistically significant association between the number of incidents that participants reported and any of the PEQ subscales. Thus it suggests that the 4 subscales (meaning, competence, self-determination and impact) of psychological empowerment do not differ with nurses reporting the number of adverse events over the previous 12 months. This finding resonates with Ballangrud and colleagues' (2012) observation in a study of medical providers in neonatal intensive care units and Snijets et al. (2009) study in coronary, medical, and surgical intensive care units using the same HSOPSC survey. Both research groups found that teamwork, staffing, and communication do not show association with number of adverse events reported. Future studies are warranted to examine if the number of events reported is the appropriate outcome variable to measure participants' degree of willingness to report adverse events.

Among all the elements of psychological empowerment measures with PEQ, "impact" is consistently found to have a significant difference in the frequencies of the three types of adverse events (near-missed, events with no potential harm, and event could harm but does not). Those who *always* report all three types have a higher score on this subscale than those who never/rarely or sometimes report. As Spreitzer (1995) described, "impact" refers to the degree a person recognizes his or her capacity to affect strategic, administrative or organizational outcomes at work to the point of making a difference.

The finding, then, suggests that nurses who *always* report adverse events could see themselves as change-agents and could believe that they can influence outcomes such as having

a positive impact on patient outcomes and improving the existing care delivery procedures. It suggests nurse leadership should emphasize impact by describing process change initiatives and quality improvement projects that sprang from adverse events reporting in forums like townhall meetings, educational events, and award recognition ceremonies.

All PEQ sub-scales, with the exception of self-determination element, showed an overall significant difference between the frequency of categories of reporting adverse events with no potential to harm the patient (see Table 5). In addition to the "impact" elements, participants' sense of their daily work is ***meaningful*** and their belief in their capability to skillfully perform work activities, ***competence***, play a role in nurses' willingness to voluntarily report adverse events that have no potential to harm patients. The findings indicate that participants who reported *always* submit an adverse event with no potential harm have a higher score on these two subscales than those who reported *sometimes* to file adverse events with no potential to harm the patient. Even without significant findings in the differences in the score for the self-determination subscale, the overall psychological empowerment score was associated with nurses' report of adverse events with no potential harm.

Adverse events that could cause harm to a patient but do not should get some attention even if they are not formally reported. Discussion of these events as such may possibly lead to corrective actions implementation to prevent reoccurrence. However, adverse events with no potential harm may often be overlooked for reporting because these events lack negative outcomes, and such events are unlikely to be noticed by healthcare practitioners. Without filing a report of adverse events with no potential harm, healthcare professionals, organization administrators may miss vital opportunities to explore faulty care delivery processes.

Limitations

As a cross-sectional survey design, study findings cannot result in causal claims. However, the use of theory-driven hypotheses offsets this limitation to some extent. The recruited research participant group was based on a convenience sample, self-enrolled, not randomly selected from a single academic, tertiary and quaternary referral health system. The demographic data of the sample are likely not representative of nurses in the United States with respect to age, experience, and education level, particularly compared to nurses working in ambulatory setting, which limits generalizability. Self-reporting survey responses are often influenced by social desirability, thus introducing possibility of response bias (Latkin, Edwards, Davey-Rothwell, & Tobin, 2018).

The survey study was implemented a few months into the COVID-19 pandemic crisis. Lack of preparedness at the hospital management level and the state and federal government levels, particularly regarding staff's personal protection equipment may have increased stress among participants (Lam et al., 2020). These conditions may have influenced participants' responses, and thus results might be different when conditions are less stressful. At the same time, the extra stress of the pandemic crisis may have made nurses less willing to participate in a research study. However, the power analysis revealed a sample size of 216 would be required to achieve a power of 0.8, and the research sample ultimately consisted of 449 participants.

Conclusion

The purpose of this study was to investigate the relationship between psychological empowerment and nurse reporting adverse events, including near-misses and adverse events that either do or do not result in harm. The findings did not suggest that any subscales in the PEQ are significantly associated with reporting the number of adverse events. These findings warrant

further exploration of the applicability of these variables to measure the degree of nurses'

willingness to report adverse events voluntarily.

The study findings show that in general, nurses who scored higher in the total

psychological empowerment score express that they would report adverse events more often

regardless of the severity of the events (near-miss, events with no potential harm or with

potential harm but none occurred). Some evidence suggests that nurses who feel psychologically

empowered also perceive themselves as having high autonomy (Ibrahim et al., 2014). Nurse

leaders should cultivate an environment that improves nurse empowerment and autonomy, such

as shared-governance in creating evidence-based strategies for delivering safe patient care.

Nurse educators can provide education in quality improvement to build a foundation of

knowledge and skills needed to implement quality improvement methodologies. Unit directors

can encourage nurses to participate in process change improvement projects to champion the

drive for better patient outcomes. The U.S. Bureau of Labor Statistics reported that registered

nurses accounted for 30 percent of total hospital employment, with over 1.8 million employed as

of May 2019 (U.S. Bureau of Labor Statistics, 2020). Nurses in the United States can be a

driving force for improving healthcare delivery through adverse events reporting, as, globally,

emphasis has become particularly focusing on disclosing adverse event reporting as a way of

exploring system improvements to enhance patient safety.

References

Alatawi, Y. M., & Hansen, R. A. (2017). Empirical estimation of under-reporting in the U.S. Food and Drug Administration adverse event reporting system. *Expert Opinion on Drug Safety, 16*(7), 761–767. https://doi.org/10.1080/14740338.2017.1323867

Backstrom, M., Mjorndal, T., & Dahlqvist, R. (2004). Under-reporting of serious adverse drug reactions in Sweden. *Pharmacoepidemiology and Drug Safety, 13*(7), 483–487. https://doi.org/10.1002/pds.962

Baker, G. R., Norton, P. G., Flintoft, V., Blais, R., Brown, A., Cox, J., Etchells, E., Ghali, W. A., Hébert, P., Majumdar, S. R., O'Beirne, M., Palacios-Derflingher, L., Reid, R. J., Sheps, S., & Tamblyn, R. (2004). The Canadian adverse events study: The incidence of adverse events among hospital patients in Canada. *JAMA, 170*(11), 1678–1686. https://doi.org/10.1503/cmaj.1040498

Ballangrud, R., Hedelin, B., & Hall-Lord, M. L. (2012). Nurses' perceptions of patient safety climate in intensive care units: A cross-sectional study. *Intensive and Critical Care Nursing*, *28*(6), 344–354. https://doi.org/10.1016/j.iccn.2012.01.001

Bayazidi, S., Zraezadeh, Y., Zamanzadeh, V., & Parvan, K. (2012). Medication error reporting rates and its barriers and facilitators among nurses. *Journal of Caring Sciences, 9*(4), 231–236

Brennan, T. A., Leape, L. L., Laird, N. M., et al. Incidence of adverse events and negligence in hospitalized patients: Results of the Harvard Medical Practice Study I. *New England Journal Med. 324*: 370-376, 1991. See also: Thomas EJ, Studdert DM, Burstin HR, et al. Incidence and types of adverse events and negligent care in Utah and Colorado. Med. Care. 2000;38(3):261-271. doi:10.1097/00005650-200003000-00003

Brennan, T. A., Leape, L. L., Laird, N. M., Hebert, L., Localio, R. R., Lawthers, A. G.,

    Newhouse, J. P., Weiler, P. C., & Hiatt, H. H. (2004). Incidence of adverse events and

    negligence in hospitalized patients: Results of the Harvard Medical Practice Study.

    Quality and Safety in Health Care 2004, 13(2), 145–152.

    https://doi.org/10.1136/qshc.2002.003822

Brenner, R. J., & Bartholomew, L. (2005). Communication errors in radiology: A liability cost

    analysis. *Journal of American College of Radiology, 2(5),* 428–431.

    https://doi.org/10.1016/j.jacr.2004.08.009

Caste, E., Ginsburg, L., Zaheer, S., & Tamin, H. (2015). Understanding nurses' and physicians'

    fear of repercussions for reporting errors: Clinician characteristics, organization

    demographics, or leadership factors? *BMC Health Services Research, 15*(326), 1–10.

Clancy C. M. (2012). Alleviating "second victim" syndrome: how we should handle patient

    harm. *Journal of Nursing Care Quality*, *27*(1), 1-5.

    http://doi.org/10.1097/NCQ.0b013e3182366b53

Cokluk, Q., & Kayri, M. (2011). The effects of methods of imputation for missing values on the

    validity and reliability of scales. Educational Sciences: *Theory & Practice, 11*(1), 303-

    309

Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: Integrating theory and

    practice. *Academy of Management Review*, *13*(3), 471–482.

    https://doi.org/10.5465/amr.1988.4306983

Cook, A., Hoas, H., Guttmannova, K., & Joyner, J. C. (2004). An error by any other name. *The*

    American Journal of Nursing, 104(6), 32–43.

    http://www.ncbi.nlm.nih.gov/pubmed/15187607

Davidson, J. E., Agan, D. L., Chakedis, S., & Skrobik, Y. (2015). Workplace blame and related

    concepts. *American College of Chest Physicians*, *148*(2), 543-548.

    http://doi.org/10.1378/chest.15-0332

Department of Health and Human Services. (2008, February 12). *Patient safety and quality*

    improvement: Proposed rule. Retrieved May 16, 2019, from

    https://pso.ahrq.gov/sites/default/files/NPRM.pdf

Hartnell, N., MacKinnon, N., Sketris, I., & Fleming, M. (2012). Identifying, understanding and

    overcoming barriers to medication error reporting in hospitals: A focus group study. *BMJ*

    Quality & Safety, 21(5), 361–368. https://doi.org/10.1136/bmjqs-2011-000299

Heard, G. C., Sanderson, P. M., & Thomas, R. D. (2012). Barriers to adverse event and error

    reporting in anesthesia. *Anesthesia & Analgesia, 114*(3), 604–614.

    https://doi.org/10.1213/ANE.0b013e31822649e8

Hobgood, C., Weiner, B., & Tamayo-Sarver, J. (2006). Medical error identification, disclosure,

    and reporting: Do emergency medicine provider groups differ? *Society for Academic*

    Emergency Medicine, *13*(1), 443–451. https://doi.org/10.1197/j.aem.2005.11.005

Holmström, A. R., Airaksinen, M., Weiss, M., Wuliji, T., Chan, X. H., Laaksonen, R. (2012).

    National and local medication error reporting systems: a survey of practices in 16

    countries. Jounral of Patient Safety, 8(4): 165-176

Ibrahim, M., Abo El-Magd, M., & Sayed, H. (2014). Nurse's psychological empowerment and

    perceived autonomy in university and teaching hospitals at Menofia Governorate/Egypt.

    Journal of Nursing Education and Practice, 4(9), 59–67

Institute of Medicine (US), Committee on Quality of Health Care in America. (2000). *To err is*

    human: Building a safer health system. National Academies Press

Jeffe, D. B., Dunagan, W. C., Garbutt, J., Burroughs, T. E., Gallagher, T. H., Hill, P. R., Harris,

    C. B., Bommarito, K., & Fraser, V. J. (2004). Using focus groups to understand

    physicians' and nurses' perspectives on error reporting in hospitals. *Joint Commission*

    Journal on Quality and Safety, 30(9), 471–479.

    http://www.ncbi.nlm.nih.gov/pubmed/15469124

Kanter, R. M. (1993). Men and women of the corporation (2nd ed.). Basic Books.

Koeh, A, R., Ebright, P. R., & Draucker, C. B. (2016). Nurses' experiences with errors in

    nursing. *Nursing Outlook, 64*(6), 566-574.

    http://dx.doi.org/10.1016/j.outlook.2016.05.012

Lam, S., Kwong, E., Hung, M., & Chien, W. (2020). Emergency nurses' perceptions regarding

    the risks appraisal of the threat of the emerging infectious disease situation in emergency

    departments. *International Journal of Qualitative Studies on Health and Well-Being, 15*(1),

    e1718468. https://doi.org/10.1080/17482631.2020.1718468

Latkin, C. A., Edwards, C., Davey-Rothwell, M. A., & Tobin, K. E. (2018). The relationship

    between social desirability bias and self-reports of health, substance use, and social network

    factors among urban substances users in Baltimore, Maryland. *Addiction Behavior, 73*: 133-

    136. Doi: 10.1016/j.addbeh.2017.05.005

Leape, L. L., Brennan, T. A., Laird, N., Lawthers, A. G., Localio, A. R., Barnes, B. A., Hebert,

    L., Newhouse, J. P., Weiler, P. C., & Hiatt, H. (1991). The nature of adverse events in

    hospitalized patients: Results of the Harvard Medical Practice Study II. *New England*

    Journal of Medicine, 324(6), 377–384. https://doi.org/10.1056/nejm199102073240605

Lightdale, J. R., Mahoney, L. B., Fredette, M. E., Valim, C., Wong, S., & DiNardo, J. A. (2009).

    Nurse reports of adverse events during sedation procedures at a pediatric hospital.

Journal of PeriAnesthesia Nursing, 24(5), 300–306.

https://doi.org/10.1016/j.jopan.2009.07.004

Mittmann, N., Knowles, S., Gomez, M., Fish, J., Cartotto, R., & Shear N. (2004). Evaluation of

the extent of under-reporting of serious adverse drug reactions. *Drug Safety*, *27*(7), 477–

487.

Moumtzoglou, A. (2010). Factors impeding nurses from reporting adverse events. *Journal of*

Nursing Management, 18(5), 542–547. https://doi.org/10.1111/j.1365-2834.2010.01049.x

O'Berirne, M., Sterling, P., Palacio-Derflinger, L., Hohman, S., & Zwicker, K. (2012).

Emotional impact of patient safety incidents on family physicians and their office staff.

Journal of American Board Family Medicine, 25(2), 177–183,

https://doi.org/10.3122/jabfm.2012.02.110166

Pahuja, S., Puri, V., Mahajan, G., Gupta, P., & Jain, M. (2017). Reporting adverse transfusion

reactions: A retrospective study from tertiary care hospital from New Delhi, India. *Asian*

Journal of Transfusion Science, 11(1), 6–12. https://doi.org/10.4103/0973-6247.200779

Prang, I., & Jelsness-Jorgensen, L. (2014). Should I report? A qualitative study of barriers to

incident reporting among nurses working in nursing homes. *Geriatric Nursing, 35*(6),

441–447. https://doi.org/10.1016/j.gerinurse.2014.07.003

Snijders, C., Kollen, B., Van Lingen, R., Fetter, W., & Molendiji, H. (2009). Which aspects of

safety culture predict incident reporting behavior in neonatal intensive care units? A

multilevel analysis. *Critical Care Medicine, 37*(1), 61–67.

https://doi.org/10.1097/CCM.0b013e31819300e4

Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions,

    measurement, and validation. *Academy of Management Journal, 38*(5), 1442–1465.

    https://doi.org/10.5465/256865

Stratton, K. M., Blegen, M. A., Pepper, G., & Vaughn, T. (2004). Reporting of medication errors

    by pediatric nurses. *Journal of Pediatric Nursing, 19*(6), 385–392

Taylor, J. A., Brownstein, D., Christakis, D. A., Blackburn, S., Strandjord, T. P., Klein, E. J., &

    Shafii, J. (2004). Use of incident reports by physicians and nurses to document medical

    errors in pediatric patients. *Pediatrics, 114*(3), 729–735

Thomas, E. J., Studdert, D. M., Burstin, H. R., Orav, E. J., Zeena, T., Williams, E. J., Howard, K.

    M., Weiler, P. C., & Brennan, T. A. (2000). Incidence and types of adverse events and

    negligent care in Utah and Colorado. *Medical Care, 38*(3), 261–271.

    https://doi.org/10.1097/00005650-200003000-00003

Thomas, K. W., & Velthouse, B. A. (1990). Cognitive elements of empowerment. *Academy of*

    Management Review, 15(4), 666–681. https://doi.org/10.5465/amr.1990.4310926

U.S. Bureau of Labor Statistics. (2020, April 27). Registered nurses made up 30 percent of

    hospital employment in May 2019. *TED: The Economics Daily*.

    https://www.bls.gov/opub/ted/2020/registered-nurses-made-up-30-percent-of-hospital-

    employment-in-may-2019.htm

Uribe, C. L., Schweikhart, S. B., Pathak, D. S., Dow, M., & Marsh, G. B. (2002). Perceived

    barriers to medical-error reporting: An exploratory investigation. *The Journal of*

    Healthcare Management, 47(4), 263–279.

    http://www.ncbi.nlm.nih.gov/pubmed/12221747

Wagner, L. M., Harkness, K., Hébert, P. C., & Gallagher, T. H. (2012). Nurses' perceptions of

    error reporting and disclosure in nursing homes. *Journal of Nursing Care Quality, 27*(1),

    63–69. https://doi.org/10.1097/NCQ.0b013e318232c0bc

Waite, S., Scott, J. M., Drexler, I., Martino, J., Legasto, A., Gale, B., & Kolla, S. (2018).

    Communication errors in radiology - Pitfalls and how to avoid them. *Clinical Imaging,*

    51, 266–272. https://doi.org/10.1016/j.clinimag.2018.05.025

Waterman, A. D., Garbutt, J. M. B., Hazel, E., Dunagan, W. C., Levinson, W., Fraser, V., &

    Gallagher T. H. (2007). The emotional impact of medical errors on practicing physicians

    in the United States and Canada. (2007). *Joint Commission Journal on Qualty and*

    Patient Safety, 33(8): 467-76. Doi.10.1016/s1553-7250(07)33050-X

Table 1. *Demographic characteristics of participants*

Variable		N	Percentage
Gender			
Female		397	88.4
Male		52	11.6
Ethnicity			
Hispanic or Latino		68	15.1
Not Hispanic or Latino		381	84.9
Age			
Range	24 - 68		
Mean	42.9		
Median	42		
Education			
High School		6	1.3
Some college, no degree		9	2.0
Associate degree		31	6.9
Bachelor's degree		282	62.8
Graduate degree		121	27.0
Years in nursing profession			
Less than 1 year		15	3.3
1 – 5 years		105	23.4
6 – 10 years		98	21.8
11 – 15 years		109	24.3
16 – 20 years		42	9.4
21 years or more		80	17.8
Certified Nurse			
Yes		359	80.0
No		90	20.0
Professional Membership			
Yes		345	76.8
No		104	23.2
Nursing Practice			
LVN		20	4.5
RN		386	87.5
APRN		15	3.4
CRNA		20	4.5
Current Work Role			
Staff Nurse		393	87.5
Nurse Educator		18	4.0
Management/Administrator		38	8.5
Employment Status			
Full-time		388	86.4
Part-time		61	13.6
Work hours per week			
Less than 20 hours		18	4.0
20 – 39 hours		264	58.8
40 – 59 hours		155	34.5
60 – 79 hours		12	2.7

Table 2: Observed number of participants in each category of number of adverse events reported and in each of the three types of adverse events.

Adverse Events	No	1-2	3-5	6-10	11 or more	Never/ Rarely	Some -times	Most of the time	Always
AE # Reported	71 (15.8)	225 (50.1)	113 (25.2)	26 (5.8)	14 (3.1)				
Near-Missed Events Reported						58 (12.9)	98 (21.8)	213 (47.4)	80 (17.8)
No Potential Harm Reported						60 (13.4)	103 (22.9)	208 (46.3)	78 (17.4)
With potential harm but does not						20 (4.5)	74 (16.5)	223 (49.7)	132 (29.4)

Note. Percentage of participant in parentheses underneath observed frequency.

Table 3: Tables of Descriptive Statistic of PEQ subscales
(For each of the subscale, N = 449)

PEQ Subscales	Subscale Score	Std. Deviation
Meaning	18.77	2.65
Competence	17.86	2.69
Self-Determination	15.46	3.54
Impact	13.52	3.97
Total Psychological Empowerment	16.40	2.58

Note: Minimum = 3.00 for each of the subscale
Maximum =21.00 for each of the subscale

Table 4: Descriptive Statistics of PEQ Subscales by Frequency of three types of adverse event reporting.

PEQ Subscales	Frequency	Near-Missed			No Potential Harm			With Potential Harm but does not		
Meaning	Never/Rarely	58	18.310	3.0504	60	18.616	2.4776	20	18.150	4.1710
	Sometimes	98	18.520	2.7025	103	18.135	3.2811	74	18.527	2.8295
	Most of the time	213	18.797	2.2559	208	18.874	2.3170	223	18.653	2.3699
	Always	80	19.312	3.1324	78	19.423	2.5098	132	19.181	2.6725
Competence	Never/Rarely	58	17.844	3.0076	60	18.166	2.4158	20	18.100	3.9189
	Sometimes	98	17.449	2.6089	103	17.165	2.9806	74	17.405	2.8183
	Most of the time	213	17.809	2.3689	208	17.872	2.4944	223	17.723	2.3321
	Always	80	18.500	3.2217	78	18.500	2.8134	132	18.303	2.9107
Self-Determination	Never/Rarely	58	14.844	3.8470	60	14.616	3.1412	20	14.450	4.0324
	Sometimes	98	14.969	2.9722	103	15.203	3.7373	74	15.202	3.6300
	Most of the time	213	15.711	3.2113	208	15.565	3.3934	223	15.334	3.2648
	Always	80	15.862	4.5970	78	16.192	3.8546	132	15.984	3.8343
Impact	Never/Rarely	58	12.137	4.4621	60	12.350	4.0161	20	11.500	5.0627
	Sometimes	98	12.75	3.3799	103	12.815	3.8085	74	12.648	3.7578
	Most of the time	213	13.754	3.5911	208	13.589	3.7602	223	13.397	3.6858
	Always	80	14.850	4.7443	78	15.179	4.2172	132	14.530	4.1598
Total Psychological Empowerment	Never/Rarely	58	15.784	2.9463	60	15.937	2.3232	20	15.550	3.6685
	Sometimes	98	15.923	2.3132	103	15.830	2.9251	74	15.945	2.6024
	Most of the time	213	16.518	2.1940	208	16.475	2.3060	223	16.277	2.2342
	Always	80	17.131	3.3161	78	17.323	2.7613	132	17.000	2.8368

Table 5. ANOVA Results and Post Hoc Tukey HSD Test Comparing Number of Adverse Events Reported, Frequency of Types of Adverse Events Reported and PEQ Subscales

Adverse Event	PEQ Subscales	$F(\eta^2)$	*p*-value	Significant Post-Hoc Comparison
Number of Adverse Events Reported	Meaning	0.21 (.00)	.934	N/A
	Competence	0.05 (.00)	.995	N/A
	Self-Determination	0.69 (.01)	.602	N/A
	Impact	1.13 (.01)	.341	N/A
	Total Psychological Empowerment	0.23 (.00)	.929	N/A
Frequency of Near-Missed Events Reported	Meaning	2.02 (.01)	.111	N/A
	Competence	2.32 (.02)	.074	N/A
	Self-Determination	1.92 (.01)	.125	N/A
	Impact	7.06 (.05)	**< .000**	Always > Never/Rarely and Sometimes Most of the time > Never/Rarely
	Total Psychological Empowerment	4.60 (.03)	**.004**	Always > Never/Rarely and Sometimes
Frequency of Event with No Potential Harm Reported	Meaning	3.80 (.03)	**.010**	Always > Sometimes
	Competence	4.12 (.03)	**.007**	Always > Sometimes
	Self-Determination	2.51 (.02)	.058	N/A
	Impact	7.70 (.05)	**< .000**	Always > Never/Rarely, Sometimes, and Most of the Time
	Total Psychological Empowerment	5.88 (.04)	**.001**	Always > Sometimes and Never/Rarely
Frequency of Event Could Harm Patient But Does Not Reported	Meaning	1.80 (.01)	.148	N/A
	Competence	2.17 (.01)	.092	N/A
	Self-Determination	1.74 (.01)	.159	N/A
	Impact	6.02 (.04)	**.001**	Always > Never/Rarely, Sometimes, and Most of the Time
	Total Psychological Empowerment	4.10 (.03)	**.007**	Always > Sometimes

The Association of Nurses' Professional Characteristics and Their Identification and Reporting of Adverse Events

This manuscript (#3) is intended for submission to *The Journal of Nursing Research.*

Loretta Y. So, Mary-Lynn Brecht, Wendie Robbins, Brennan Mason Ross Spiegel, and

Carol Pavlish

Abstract

Background: The current climate of significant underreporting of adverse events by healthcare providers, curtails the opportunity to explore preventable medical errors, improve system care delivery processes, and achieve better patient outcomes.

Objectives: The aims of this study are: 1) to examine nurses' identification of different types adverse events and their intention to report each type; and 2) to explore if nurses' professional characteristics (education level, work role, staff position, specialty nursing certification, and professional society membership) are related to nurses' adverse event reporting.

Methods: The cross-sectional survey study was conducted online among nurses in a large academic, tertiary and quaternary referral health system in a metropolitan city in the United States. The Hospital Survey of Patient Safety Culture from the Agency for Healthcare Research and Quality and five adverse event scenarios with various levels of outcomes were examined with nurses' professional characteristics.

Results: For each of the proposed clinical scenarios, the more the participants agreed that the proposed clinical scenarios were adverse events, the more likely they were to report those incidents. The number of adverse events reported differed significantly by level of nursing practice and their work role. Frequency of reporting near-missed events and events with no potential harm significantly differed by nursing education. Nurses with a professional

certification were less likely than those without to report adverse events that have potential harm. Professional society membership did not show significant difference in number of adverse event reports.

Discussion: Staff education on identifying various types of adverse events (omission, near-missed, events with no harm, events with reversible harm and events with irreversible harm) could improve adverse event reporting. Encouraging conversations, discussions, and sharing of decision-making processes among nursing staff with various professional backgrounds, such as education, level of practice, and work role could encourage adverse event reporting.

Key Words: Patient Safety, Nursing education, Nursing certification, Adverse event reporting

In response to reports about the magnitude of the preventable adverse events in New York (Leape et al., 1991), Utah, and Colorado (Thomas et al., 2000), the Institute of Medicine (IOM) concluded a four-year investigation about adverse events in the United States (U.S.). IOM's landmark report *To Err Is Human* estimated between 44,000 and 98,000 deaths annually in the U.S. could be attributed to preventable medical errors (IOM, 2000). Research also demonstrates adverse events in healthcare in other countries; for example, researchers also identified that among 2.5 million annual hospital admissions in Canada, over 185,000 adverse events occurred, and of those, 70,000 adverse events were potentially preventable (Baker et al., 2004).

As for the nature of adverse events, surgical procedures accounted for 30-50% of reported events (Brennan et al., 2004; Leape et al., 1991). Van Delft and colleagues (2017) reported imaging equipment and other technical instruments were the top two attributors related to adverse events during orthopedic trauma surgery in their study. A higher than previously reported adverse events rate related to oncological spine surgery suggested preventative strategies must be in place to reduce adverse events in this fragile patient population (Dea, et al., 2014). Among non-surgical adverse events, drug-related incidents were the largest category (Alatawi & Hansen, 2017). Other reported adverse events were commonly associated with diagnostic tests and procedural and system issues (Brennan et al., 2004; Leape et al., 1991; Thomas et al., 2000). Other studies found adverse events reported were associated with patients undergoing anesthesia care (Heard et al., 2012), and moderate sedation by nurses (Lightdale et al., 2009).

Studies of settings have shown that adverse events are reported in every corner of hospitals, such as intensive care units (Leape et al., 1991; Brennan et al., 2004), emergency

rooms (Hobgood et al., 2006), and radiology services (Brenner & Bartholomew, 2005; Waite et al., 2018). Outside hospitals, there are reports in dialysis centers (Tennankore et al., 2015), homecare (Masotti et al., 2010), and ambulatory settings (Assiri et al. 2018; Lang et al., 2016; Woods et al., 2007).

An investigation of the financial impact of adverse events showed that an estimated direct cost of $17 billion in the U.S. was spent providing medical and prescription drug services that could be saved if medical errors were avoided (Shreve et al., 2010). The same study attributed $1.4 billion in these costs was related to the increased mortality rates among patients who experienced medical errors during their hospitalizations. Researchers also estimated that loss of productivity among affected patients as reported in short-term disability claims cost the U.S. economy $1.1 billion.

Another report examined the financial impact of poor-quality care on a human level, impacting not only the affected patients, but also their families. As a human life's value is incalculable in the eyes of the family, scholars applied quality-adjusted life years in their study. Goodman and colleagues (2011) concluded that the economic impact of medical errors may reach $1 trillion dollars each year. Other studies examined negative emotional impacts on healthcare providers who may be involved in or observe errors. Two such studies that focused on nurses specifically showed that such involvement, direct or indirect, or error observation can lead to more frequent experience of moral distress (Ludwick & Silva, 2003) and a stronger intent to leave their profession in the near future (Hwang & Park, 2014).

Research reports on the impact of errors sent a shock wave into the medical community and the healthcare industry. Healthcare professionals urged collaborative efforts to reduce preventable medical errors and achieve the common goal of delivering safe, effective, timely,

equitable care for their patients. This paper describes a study that explored whether nurses' professional characteristics are related to nurses' reporting of adverse events.

Background

To Err Is Human (IOM, 2000) raised awareness of healthcare quality and patient safety among healthcare professionals and health organizations to an unprecedented degree. In this report, the IOM called on all healthcare professionals, hospital leaders, and the federal government to make improving patient safety a national priority. In response to the IOM report and its recommendations, the U.S. Congress appropriated an annual budget of $50 million for patient safety research in 2001 (Leape, Berwick, & Bates, 2002).

The IOM stated, "An error is defined as the failure of a planned action to be completed as intended (i.e. error of execution) or the use of a wrong plan to achieve an aim (i.e. error of planning)" (IOM, 2000, p. 28). Further, it clarified: "An adverse event is an injury caused by medical management rather than the underlying condition of the patient. An adverse event attributable to error is a 'preventable adverse event'" (IOM, 2000, p. 28). The World Health Organization (WHO) defined *incident* as "an event or occurrence that may cause or causes an interruption or a crisis" (WHO, 2012, p. 2). Likewise, WHO defined *near miss* as an event or situation that has the potential to harm a patient but in which harm "did not reach the patient" (WHO, 2012, p. 3).

Authors of *To Err Is Human* stated that while human mistake is the commonest source of patient safety incidents, it stressed, instead of simply an individual healthcare provider mistake, that an incident should be treated as the result of a complicated organizational structure and cultural breakdown (IOM, 2000).

The report called on all healthcare professionals, hospital leadership, and the federal government to develop specific system-level strategies that make patient safety a top priority in ensuring quality care.

Despite ongoing efforts to reduce adverse events and substandard care, the problems continue (Baines et al., 2013; Landrigan et al. 2010; Makary & Daniel, 2016). Over the last decade a series of challenges, such as error reporting, have provided a greater case for hospital to concentrate on patient safety. However, the progress of promoting patient safety has been, "frustratingly slow" (Wachter, 2010, p. 1). Improvement of patient safety within hospitals has been minimal (De Vires et al., 2010).

To decrease preventable medical error incidents, the IOM recommended confidential, voluntary reporting of injuries due to medical care. IOM researchers emphasized that adverse event reporting is one of the major mechanisms to identify incidents resulting from medical errors. The WHO (2009) confirmed that focusing on culture, additional reporting, and learning from errors are important strategies for improving patient safety in hospitals today. The U.S. Congress responded by creating the 2005 Patient Safety and Quality Improvement Act that requires each healthcare organization to establish a reporting system that encourages staff to report adverse events (Department of Health and Human Services, 2008). The objective was to continue the momentum of promoting patient safety, to facilitate the exploration of adverse events, and to assist healthcare providers to understand the nature, root causes, and contributing factors leading to these events. This objective encourages healthcare organizations to utilize the lessons learned to adjust relevant systemic care delivery processes and reduce the odds of human error.

However, research studies have identified an alarmingly low adverse event reporting rate (Backstrom et al., 2004; Lightdale et al., 2009), which may hinder efforts to reduce medical errors. For example, these studies identified adverse events underreporting related to non-surgical procedures (Backstrom et al., 2004) and near-miss events in nursing home facilities (Wagner et al., 2012). A study also showed that nurses underreport adverse events associated with procedural sedation in children (Lightdale et al., 2009). Additional studies revealed underreporting of drug-related adverse events in the U. S. (Mittmann et al., 2004) and in Sweden (Backstrom et al., 2004). More recent studies show a persistence of the problem, both in underreporting of adverse drug reactions through the U.S. Food and Drug Administration Adverse Event Reporting System (Alatawi & Hansen, 2017), and underreporting of blood transfusion reactions in India (Pahuja et al., 2017).

Underreporting is clearly a significant problem in need of address; the need for investigations into their causes and potential measures to address the problem is likewise clear. Without information from adverse events related to medical errors, healthcare organizations and healthcare providers miss opportunities to review systemic issues and to explore human factors that lead to adverse events. Without such reviews and explorations, reoccurrences of these events continue to harm patients, sometimes even fatally.

In their examination of the healthcare professionals' unwillingness to report adverse events, Heard and colleagues (2012) reported that anesthesiologists were embarrassed about the mistakes committed, were afraid that they would be blamed, and felt that reporting might lead to trouble or litigations (Heard et al., 2012). Greek nurses preferred to avoid undesired attention from the public, and they believed that reporting was cumbersome (Moumtzoglou, 2010). The culture that assigns blame to individuals in a healthcare institution when errors, particularly those

that are associated with bad patient outcomes, occur plays a role in discouraging nurses to report

adverse events. Nurses have reported individual care providers were blamed instead of faulty

systems, processes, or technologies (Bayazidi et al., 2012; Cook et al., 2004; Uribe et al., 2002).

The perceived lack of support from unit-level supervisors and high-level administrators decrease

nurses' intent to report adverse events (Cook et al., 2004; Prang & Jelsness-Jorgensen, 2014;

Stratton et al., 2004).

Furthermore, concerns over personal repercussions reduce nurses' desire to report

medical errors. Nurses report fear that their healthcare institute will punish them if they report

safety discrepancies (Bayazidi et al., 2012; Castel et al., 2015; Jeffe et al., 2004). They were

afraid of being judged as incompetent by colleagues, experiencing negative attitudes from

patients (Cook et al., 2004; Hartnell et al., 2012; Stratton et al., 2004), and receiving potential

unfavorable publicity in the press (Moumtzoglou, 2010). Nurses fear diminishing confidence in

their work (Jeffe et al., 2004), facing exposure to malpractice suits (Hartnell et al., 2012), and

potentially losing their nursing license (Stratton et al., 2004). Nurses also expressed their

uncertainty about what was considered an error (Uribe et al., 2002) and concerns over

implicating other colleagues (Taylor et al., 2004). Receiving no support from their healthcare

organizations (Uribe et al., 2002) and nurse administrators (Stratton et al., 2004) was an

additional concern expressed by some nurses. Distractions and interruptions as well as lacking

time to report (Jeffe et al., 2004; Uribe et al., 2002) and being uncertain about the benefits of

reporting error (Uribe et al., 2002) also depress adverse event reporting efforts.

Researchers have examined if nurses' professional characteristics may play a role in

adverse event reporting. It has been found, for example, that novice nurses need a supportive

environment to identify near-missed incidents and adverse events (Ebright et al., 2004). These

novice nurses reported that they faced heavy responsibilities and lack of guidance on decision-

making processes that diminish their ability to report adverse events (Ebright et al., 2004). A

study of bachelor's degree nursing students comparing those in an accelerated program with

students in a more traditional program found that those two groups differed in the types of events

they were likely to report. Those in accelerated programs reported more adverse events, while

those in traditional programs reported more near-missed and sentinel events (Sanko et al., 2018).

Based on a survey of Master's level nursing programs, Meints (2000) reported that 75% of

programs promoted awareness of reporting adverse drug events. In an integrative review of 24

studies that explored the relationship between nurses' education and patient safety, Ridley (2008)

found that number of care hours and nurses' skill mix were associated with improved patient

safety, but none of the studies established a link between nurse education level and patient

safety. Cary (2001) found that certified nurses believed that their certification led to fewer

adverse events and errors in their clinical practice. However, research about the impact of nurse

certification on patient outcomes is limited.

The literature to date has not directly examined the relationship of nurses' professional

characteristics with quantity and type of adverse events reported. This is a vital area of study,

given the number of nurses in a position to provide reporting. To cite one statistic, registered

nurses accounted for 30 percent of total hospital employment in 2018 (U. S. Bureau of Labor

Statistics, 2020). To address this significant gap, the research questions for this current study

were: 1) Do nurses identify different types of adverse events and if they would report such events

based on their determination of agreement or disagreement? 2) Are nursing professional

characteristics (education level, work role, staff position, specialty nursing certification, and

professional society membership) associated with the number of adverse event nurses reporting?

3) Are nursing professional characteristics associated with nurses' frequency of reporting of three types of adverse event (near-missed, events with no potential harm, and events with potential harm but do not)?

Study Methods

Study Purpose and Design

The purpose of this cross-sectional survey study was to explore if professional characteristics such as education, work role, level of practice, professional certification, and professional society membership are related to nurses' reporting of adverse event. In view of studies that reported healthcare professionals disagreed on what constituted error and if those incidents should be reported (Cook, Hoas, Guttmannova & Joyner, 2004; Elder, Palleria, & Regan, 2006), the current study also explored nurses' agreement on adverse event identification and their intent to report such incidents.

Recruitment and Participants

Participants were nurses who were recruited within a large, academic, tertiary and quaternary referral health system in a metropolitan area located in the southwest region of the United States. The Principal Investigator (PI) implemented this online survey study through email recruitment on June 9th , June 23rd , July 7th , and July 21st, 2020. The PI also distributed research flyers to all nursing units in the healthcare system and answered nurses' questions about the study in person and on email. All nursing roles including Licensed Vocational Nurses (LVNs), Registered Nurses (RNs), and Advanced Practice Registered Nurses (APRNs), aged 21 or older, who worked in the targeted academic health system for at least six months at the time of their participation were invited to participate. Recruitment emails emphasized that participation was totally voluntary, and no identifiable information would be collected in the survey. All

responses were collected through an online platform which was safeguarded with high-end firewalls network security and compliant with HIPAA regulations. Participants could access the online survey with a web link or by scanning a QR code with their mobile devices provided in the recruitment emails and flyers.

Ethical Considerations

The internal review board at the Office of the Human Research Protection Program at the institutional setting reviewed and approved the study and all recruitment communications. The nursing executive, nursing leaders, and the Nursing Research Council of the health system approved all data collection activities and supported the research efforts.

Measurement

There were three sets of questions in this online survey, which was uploaded onto a secure online platform (Qualtrics) for survey distribution and data collection. The first set of questions contains five scenarios with five severity levels: omission, near-missed, event with no harm observed, event with reversible harm, and event with irreversible harm (death). PI of this study adapted sample scenarios from the literature on types of adverse events that occur in clinical practice. The scenarios were as follows:

1. A patient missed a midday dose of oral antibiotics because he was not in his room. (Omission.)

2. D5% IV fluid bags incorrectly stocked in Pyxis drawer labeled for 0.9% NS. (Near-Missed.)

3. Acetaminophen administered to a wrong patient. Patient did not experience any harm. (No Harm.)

4. A patient developed a badly infected IV site during hospitalization. The IV was removed and the patient eventually recovered. (Reversible Harm.)

5. A patient fell and sustained a cerebral hemorrhage during hospitalization. Family declined surgical intervention. The patient died within a week from the injury. (Irreversible Harm.)

Two survey questions about these five scenarios sought participants' responses. First, participants were asked if they would consider each of these five scenarios an adverse event/medical error. Participants indicated the extent to which they agreed with each scenario on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Second, participants were asked if they would report each of these five scenarios with a binary choice, yes or no.

In addition to the five proposed clinical scenarios, the second set of questions was the Hospital Survey of Patient Safety Culture (HSOPSC) from the Agency for Healthcare Research and Quality (AHRQ). Questions concerned the number of events and frequency of three types of events (event caught before reaching patient, event with no potential harm, and event with potential harm but did not) reported by participants in the most recent 12 months, at the time respondents participated in the study. The third set of questions pursued demographic information from participants on level of education, level of nursing practice, work role, status of their professional certification and professional society membership.

Data Analysis

Among the 476 participants who participated in this study, 27 did not answer any questions, so they were not included in the data analysis processes, leaving a sample of 449. Single imputation using the EM algorithm was applied to impute missing data on the 92 survey

responses with some missing data. Responses were anonymous, but participants specified their credentials and staff positions.

Of the 449 participants whose responses were analyzed, 12 reported having submitted 11 to 20 events reports in the past twelve months and 2 reported submitting 21 event reports or more. Due to the small counts in these two categories, they were combined into the category of 11 event reports or more. The number of adverse events were then categorized as: No event reports (N = 71, 15.8%), 1 to 2 event reports (N = 225, 50.1%), 3 to 5 event reports (N = 113, 25.2%), 6 to 10 event reports (N = 26, 5.8%), and 11 event reports or more (N = 14, 3.1%).

In terms of credentials, participants included 20 certified registered nurse anesthetists (CRNAs) and 15 advance practice registered nurses (APRNs). Certified registered nurse anesthetist is one of the major advanced practice areas for nurses, so, given the small counts in these two groups, they were combined, and all labeled the APRN group. Among the ~~476~~ 449 participants, 6 reported they had completed nursing vocational training (LVNs), 9 had attended some college but not obtained a degree, and 31 held a Registered Nurse (RN) license with an Associate's degree. Due to the small counts in these groups of nurses, they were combined into one category labeled "Vocational license (LVN) to RN with Associate's Degree."

Chi-square tests were performed to determine whether the levels of agreement or disagreement of reporting the five scenarios are related to whether nurses would report incidents such as those described.

Twenty chi-square tests of independence were utilized to assess the associations between (a) the number of adverse events reported and (b) the frequency of three different adverse event types (i.e. near-missed, event with no potential harm, and event with potential harm but do not) reported with (1) education (license / degree level), (2) professional certificate, (3) professional

society membership, (4) work role (staff, nurse educator, administrator), and (5) level of nursing

practice (RN or APRN). For the results that were statistically significant, post hoc Pearson

adjusted residuals test was used to facilitate interpretation of results.

Statistical significance was defined as a p-value ≤ 0.05. All analyses were performed in

IBM SPSS (Statistical Package for the Social Sciences) Version 27 (SPSS Inc., Chicago, IL,

USA).

Results

There were 449 total respondents included in this study. The majority of the participants

were female (88.4%) and not Hispanic or Latinx (84.9%). This sample represented a range of

ages (24-68) with a mean age of 42.9 years. The majority of the participants were Registered

Nurses (87.5%), and nurses in all levels of nursing practice (LVN, RN and APRN) who work as

staff nurses (87.5%). Table 1 presents the demographic characteristics of the participants.

Findings from chi-square analysis show that for each of the five scenarios, there was a

significant difference in those who would report such incidents and their level of agreement

whether the incident was an adverse event ($p < .001$, Table 2). Those who strongly agreed that

the proposed incident was an adverse event/medical error had a higher than expected likelihood

to respond "Yes" to report such incidents (Table 3) (Adjusted residuals: events of omission 7.6,

near-missed events 6.2, no harm events 4.0, events with reversible harm 8.3, and events with

irreversible harm 4.3)

Six statistically significant relationships were found among the number of adverse events

reported, and the frequency of reporting each of the three types of adverse events with various

nurses' professional characteristics revealed six statistically significant relationships (Table 4):

i.   The number of adverse events reported and level of nurses' education (Vocational

license to Registered Nurse (RN) with Associate degree, RN with Bachelor's

degree, and RN with Graduate degree) , $X^2(8) = 17.57$, $p < .025$.

ii.   The number of adverse events reported and work role (staff nurse, nurse educator,

and nurse administrator) showed, $X^2(8) = 19.32$, $p < .013$.

iii.   The number of adverse events reported and level of nursing practice (RN and

APRN), $X^2(8) = 23.29$, $p < .003$.

iv.   The frequency of near-missed events reported and different types of nursing degree

(Vocational license to RN with Associate's, RN with Bachelor's degree, and RN

with Graduate degree), $X^2(6) = 17.73$, $p < .007$.

v.   The frequency of reporting events with no potential harm and different types of

nursing degree (Vocational license to RN with Associate's Degree, RN with

Bachelor's degree, and RN with Graduate degree) showed a statistically significant

association, $X^2(6) = 17.60$, $p < .007$.

vi.   The frequency of reporting events that could cause harm but do not, and if nurses

attained a professional certificate (Yes or No) association , $X^2(3) = 10.58$, $p < .014$.

A post hoc test using adjusted standardized residuals was performed on these six

associations that were found to be statistically different. Table 5 represents the post hoc test

results showing the association between the number of adverse events reporting with nurses'

work roles and their level of practice. Table 6 shows the post hoc test results between nurses'

academic degrees and their status of nursing specialty certification with frequency of reporting

three types of adverse events.

Education Level and Number of Adverse Events Reported

On examining the post hoc testing results of number of adverse events reported by nurses' with different education levels (Vocational license to RN with Associate's degree; RN with Bachelor's degree; and RN with Graduate degree) (Table 5), and from the descriptive statistics perspective, regardless of education level, the most commonly reported number of adverse events was 1-2. Among Vocational license to RN with Associate degree 39.1% reported 1-2 events, RN with Bachelor's degree 55.7% and RN with Graduate degree 41.3%. While examining the inferential statistics, the strongest contributors to the chi-square significant difference among groups (Table 4, $p < .025$), was the Bachelor's degree group. There were more than expected number of Bachelor's degree nurses who reported 1-2 adverse events (adjusted residual = 3.1). At the same time, there were less than the expected number of nurses with Bachelor's degree who reported no adverse events (adjusted residual = -3.1). Thus, the inferential statistics show nurses with Bachelor's degree tend to report 1-2 events and are less likely to indicate that they did not report adverse events.

On examining nurses with vocational license to RN with Associate's degree, there were fewer than expected number of this group of nurses who responded that they had reported 1-2 adverse events (adjusted residual = -1.6), and there were more than expected number of these nurses who responded that they had reported no adverse events (adjusted residual = 2.4). The inferential statistics suggested that nurses with Vocational license to RN with Associate's degree tend not to report adverse events.

There are fewer than expected number of nurses with a Graduate degree who indicated they reported 1-2 adverse events in a year (adjusted residual = -2.3) and more than expected number of these nurses who reported no adverse events (adjusted residual = 1.7). The

inferential statistics suggested that nurses with a Graduate degree tend not to report adverse events.

Nurses' Work Roles and Number of Adverse Events Reported

On examining the post hoc testing results of number of adverse events reported with nurses' different work roles (staff nurse, nurse educator, and nurse administrator) (Table 5), and from the descriptive statistics perspective, regardless of the work roles, the most commonly reported number of adverse events was 1-2 (staff nurse 51.7%, nurse educator 55.6%, and nurse administrator 31.6%). However, when examining the inferential statistics, the strongest contributors to the chi-square significant difference among groups (Table 4, $p < .013$), was the nurse administrator group. There were more than the expected number of nurse administrators who responded that they had reported 6-10 adverse events (adjusted residual = 3.5). At the same time, there were fewer than the expected number of nurse administrators who responded that they had reported 1-2 adverse events (adjusted residual = -2.4). Thus, the inferential statistics show that nurse administrators tend to report 6-10 adverse events, and they are less likely to report 1-2 adverse events, in the 12 months prior to the time nurses participated in this study). While in the staff nurse group, there were fewer than expected number of staff nurses who responded that they had reported 6-10 adverse events (adjusted residual = -2.3), and there were more than expected number of staff nurses responded that they had reported 1-2 adverse events (adjusted residual = 1.7), in a year. The inferential statistics suggested that staff nurses tend to report 1-2 adverse events, and that they are less likely to report 6-10 adverse events annually. As for nurse educators, the inferential statistical results suggest that among 5 levels of number of adverse events reported, nurse educators are more likely not to report adverse event (adjusted residual = 1.4).

RN and APRN Levels of Nursing Practice and Number of Adverse Events Reported

For the analysis on association between nursing practices, there were 20 LVNs, 386 RNs and 35 APRNs who participated in the study. Due to the small number of LVN participants, and the nature of different responsibilities among these three levels of nursing practice in a hospital setting, data analysis was conducted on responses from RNs and APRNs only. On examining the association between the two nursing practice levels (Table 5), the descriptive analysis shows that the most commonly reported number of adverse events was 1-2 (RN 49.22%, APRN 52.3%). The inferential statistical results show that APRN was the major contributor to the chi-squared significant difference between these two types of nursing practice (Table 4, $p \leq .003$). The inferential statistical results suggested that APRNs tend to report no adverse events (adjusted residual = 3.4) and they are less likely to report 3-5 adverse events (adjusted residual = -2.0). RNs tend to report 3-5 adverse events (adjusted residual = 2.7) and are unlikely to report no adverse events occurred (adjusted residual = -3.2).

Education Level and Professional Certificate Status and Report Frequency of Three Types of Adverse Event.

For near-missed events (Table 6), inferential statistical results suggested that nurses with Vocational license to RN with Associate's Degree tend to *always* report (adjusted residual = 2.4); nurses with Bachelor's Degree tend to report *most of the time* (adjusted residual = 3.6), and nurses with Graduate Degree tend to report such events *sometimes* (adjusted residual = 2.2).

For events with no potential harm (Table 6), inferential statistical results show similar patterns to the near-missed event types, i.e. nurses with Vocational license to RN with Associate's Degree tend to *always* report (adjusted residual = 2.1), nurses with Bachelor's

Degree tend to report *most of the time* (adjusted residual = 3.0), and nurses with Graduate Degree tend to report *sometimes* (adjusted residual = 2.6)

For events that could harm patients but do not (Table 6), inferential statistical results showed that non-certified nurses tend to *always* report (adjusted residual = 2.5), and certified nurses tend to report such events *most of the time* (adjusted residual = 2.5).

Discussion and Implications

The five proposed clinical scenarios used for this research represented five different outcomes of adverse events: events of omission; near-missed events; and events resulting in no harm, reversible harm, and irreversible harm. Findings showed that participants would report when they were in strong agreement with their determination that this was adverse events (Table 2). As well, the higher the degree of severity of adverse event outcomes, the higher the possibility that participants would report the incidents (Table 3). This finding could indicate that nurses are more likely to recognize an incident as an adverse event when harm is greater. Results also indicated that respondents do not generally consider events of omission, meaning a lack of action that should have been completed, as adverse events. Nurses may also disregard near-missed events, as these incidents are errors that could have caused harm to patient but did not occur as a result of chance or mitigation. A study among 1300 staff nurses revealed disagreements about what constitutes a medication error (Wakefield, 1999). These results suggest that educating nurses and other healthcare providers to recognize that errors of omission and near-missed events are indeed adverse events and should be reported. Such education programs could increase the likelihood that nurses and healthcare professionals would report such incidents, so action can be initiated to correct faulty care delivery processes.

Regarding adverse reporting behavior of staff nurses in terms of number of events reported, the inferential statistical results of the current study suggested that nurses' with Bachelor's degree tend to report 1-2 adverse events, and nurses with Vocational license to RN with Associate's degree and RNs with Graduate degree tend not to report adverse events. This finding advocates staff education emphasize the importance of reporting among nursing staff with vocational license to RN with Associate's degree and RNs with a Graduate degree. Even though nurses with Bachelor's degree tend to report 1-2 adverse events in a year, nurse education on adverse events report is much needed, across the spectrum of education levels.

Our finding also demonstrated that staff nurses tended to report 1-2 adverse events annually, and that they were less likely to report 6-10 adverse events. In contrast, nurse administrators tend to report 6-10 adverse events annually. Generally. one would believe that patients' primary nurses, who have first-hand knowledge about their patients' treatment details, would be the healthcare professional most likely to report adverse events. Taking this assumption into consideration, we would expect staff nurses would report more than 1-2 adverse events a year, but our results found otherwise. The possible explanation is that staff nurses often have competing priorities, time restraints, and other emotional factors that may affect their intent to report and frequency of doing so. Findings on the low report rate could also indicate that hospital systems might have constructed unintended barriers for staff nurses to report adverse events. On the other hand, nurse administrators must be made aware of adverse events reported by all staff nurses who work in the nursing unit(s) that they oversee. Nurse administrators might also understand the importance of filing adverse events as a means to raise awareness of these unfortunate incidents, so exploration of causes and discussion of corrective actions can begin.

Findings from this study can serve as a reference point for nurse administrators that the number of adverse events reported by staff nurses and nurses with Bachelor's degrees are in the range of 1-2 in a year. Education can be coordinated with nurse educators to increase staff nurses' adverse event reporting efforts by enhancing their knowledge about identification of adverse events and the values of reporting. Nurse administrators should provide supports, such as time during nurses' work shifts and a quiet environment without interruptions for documenting purposes, such as adverse event reporting. Nurse leaders collaborating to create a blame-free, just culture is another important initiative to encourage staff nurses to report adverse events and promote patient safety (Battard, 2017; Edwards. 2018). Nurse administrators should encourage nursing staff to participate in quality improvement projects to improve care delivery processes to provide safe care. The more engaged staff nurses are in care improvement projects, the more likely staff nurses will embrace safety measures such as the necessary efforts and opportunities to report incidents of concern to them (Dempsey & Assi, 2018).

Among the two nursing practices, RN and APRN, our findings show that APRNs tended to report no adverse events and RNs tended to report 3-5 adverse events. As there are no clear explanations for the lack of adverse event reporting among the participating APRNs in our study, this remains an area of interest for future research project to explore. However, regardless of nursing practice roles, nursing and hospital administrators should encourage the shared responsibilities of adverse events reporting across all levels of nursing practice and among all healthcare providers across our nation and around the globe.

In examining nurses' behavior of reporting **near-missed incidents**, the findings of the study indicate that in the category of near-missed events, nurses with Vocational license to RNs with an Associate's degree tended to *always* report, nurses with Bachelor's degree were more

likely to report *most of the time*, and Graduate degree nurses would report such incidents *sometimes* (Table 6). Regarding reporting **events with no potential harm**, our findings show that nurses with a Vocational license to RNs with an Associate's degree *always* reported, nurses with a Bachelor's degree reported *most of the time*, and nurses with a Graduate degree would report *sometimes*. These patterns are consistent across the near-missed and events with no potential harm. The same patterns were observed in comparing nurses who are certified with those who are not certified. The non-certified nurses tended to respond that they *always* report, but certified nurse's said they would report *most of the time*, but only if **events could harm patient but do not**.

A summary of study findings appears to show that the fewer credentials (education degree and status of certification) nurses have, the more likely they are to express intent to *always* report adverse events, regardless of the outcomes of the events (near-missed, events with no potential harm, events could harm but do not) . This could stem from a "I'll be a model employee" approach. By reporting adverse events, in this case, these nurses are being reliable, doing what their employer expects, showing initiative to make the adverse event known and being committed to improving patient care through corrective actions related to the incidents they report. Employees with higher credentials may feel confident justifying decisions not to report such incidents. They may believe using their knowledge from their higher education or special skill-set from their certification will allow them to correct errors that they identified before reaching patient (near-missed events) and thus may believe they do not need to report such incidents. They may also believe that they could make a judgment call not to report events particularly those that do not result with harm to patients. However, these findings suggest that regardless of their level of credentials or education, nurses need education on the importance of

adverse event reporting. Discussions could be geared towards why adverse events need to be reported, so exploration of root causes can begin, and corrective actions can be put in place to improve patient care delivery system.

Without a focused, in-depth conversation with nurses from different education and professional backgrounds, the true causes of these analyzed nurses' behaviors of reporting adverse events in this study remain unknown. Therefore, future studies should probe rationalizations using appropriate methods, and explore personal and system-level barriers to reporting adverse events. Future research could also explore nurses' beliefs about how to create blame-free cultures that promote adverse event reporting.

Limitations

The recruited research participant group was based on a self-enrolled, convenience sample not randomly selected from a single academic, tertiary, quaternary referral medical center in the US West Coast. The characteristics of the participating group of nurses, such as education degrees, nurses' status of professional certification, professional society membership could be a reasonable representation of nurses working in an academic medical center in the U.S. nursing population. Nonetheless findings should be generalized with care, especially to community and rehabilitation health facilities in non-urban settings, where the characteristics of nurses are likely to differ considerably.

Some of the chi-square tests lost power to detect differences (i.e. the ability to reject a false null hypothesis, thus may have increased the chance of a type II error) due to cell sizes that fell below five. Future studies can decrease the risk of committing a type II error, by increasing the sample size to increase the power of the test, to detect a practical difference only when one truly exists.

Conclusion

The IOM report referenced two large studies conducted in the early 1990s', reporting adverse events occurred in 2.8 to 3.7 percent of hospitalizations (IOM, 2000). Recent publications reported continued issues with adverse events occurrences in the hospital settings (Dea, et al.,2014; Makary & Daniel, 2016). The common theme observed in our findings show that, regardless of nurses' education levels, their nursing practice levels, and their work roles, they responded that they had reported 1-2 adverse events in the prior twelve months at the time of their participation to the study. One would conjecture that adverse event reporting frequency among nurses is low. As mentioned earlier, there were studies examining reporting barriers such as nurses feeling embarrassed, fear of being blamed, possible litigations; cumbersome, non-intuitive reporting system and lack of support from the healthcare organization. The time has come for researchers, educators, computer program specialists and healthcare administrators to explore and implement programs, with measurable goals to enhance adverse events reporting. Research findings can provide a glance into the needed elements, tailored to special professional characteristics to be taken into considerations when constructing such programs. These initiatives can be specifically structured to enhance and promote adverse event reporting, particularly among nurses, who are the front-line care delivery providers, the passionate force that provides quality care for patients , and the primary healthcare protectors who safeguard patient safety.

Conflict of Interest

The author declares that there is no conflict of interest.

References

Alatawi, Y. M., & Hansen, R. A. (2017). Empirical estimation of under-reporting in the U.S.

Food and Drug Administration adverse event reporting system. *Expert Opinion on Drug*

Safety, 16(7), 761–767. https://doi.org/10.1080/14740338.2017.1323867

Assiri, G. A., Shebl, N. A., Mahmoud, M. A., Aloudah, N., Grant, E., Alijadhey H., & Sheikh,

A. (2018). What is the epidemiology of medication errors, error-related adverse events

and risk factors for errors in adults managed in community care contexts? A systematic

review of the international literature. *BMJ Open*, *8*(5), e019101.

https://doi.org/10.1136/bmjopen-2017-019101

Backstrom, M., Mjorndal, T., & Dahlqvist, R. (2004). Under-reporting of serious adverse drug

reactions in Sweden. *Pharmacoepidemiology and Drug Safety, 13*(7), 483–487.

https://doi.org/10.1002/pds.962

Baines, R. J., Langelaan, M., De Bruijne, M. C., Asscherman, H., Spreeuwenberg, P., Van De

Steeg, L., Siemerink, K. M., van Rosse, F., Broekens, M., & Wagner, C. (2013). Changes

in adverse event rates in hospitals over time: A longitudinal retrospective patient record

review study. *BMJ Quality and Safety, 22*(4), 290–298. doi:10.1136/bmjqs-2012-001126

Baker, G. R., Norton, P. G., Flintoft, V., Blais, R., Brown, A., Cox, J., Etchells, E., Ghali, W. A.,

Hébert, P., Majumdar, S. R., O'Beirne, M., Palacios-Derflingher, L., Reid, R. J., Sheps,

S., & Tamblyn, R. (2004). The Canadian adverse events study: The incidence of adverse

events among hospital patients in Canada. *JAMA, 170*(11), 1678–1686.

https://doi.org/10.1503/cmaj.1040498

Battard, J. (2017). Nonpunitive response to errors fosters a just culture. *Nursing Management,*

48(1), 53-55. Doi: 10.1097/01.NUMA.0000511184.95547.b3

Bayazidi, S., Zraezadeh, Y., Zamanzadeh, V., & Parvan, K. (2012). Medication error reporting

    rates and its barriers and facilitators among nurses. *Journal of Caring Sciences, 9*(4),

    231–236

Brennan, T. A., Herbert, L., Laird, N. M., Lawthers, A., Thorpe, K. E., Leape, L. L., Localio, R.,

    Lipsitz, S. R., Newhouse, J. P., Weiler, P. C., & Hiatt, H. H. (1991). Hospital

    characteristics associated with adverse events and substandard care. *JAMA, 266*(24),

    3265–3269. https://doi.org/10.1001/jama.1991.03460240061028

Brennan, T. A., Leape, L. L., Laird, N. M., Hebert, L., Localio, R. R., Lawthers, A. G.,

    Newhouse, J. P., Weiler, P. C., & Hiatt, H. H. (2004). Incidence of adverse events and

    negligence in hospitalized patients: Results of the Harvard Medical Practice Study.

    Quality and Safety in Health Care 2004, 13(2), 145–152.

    https://doi.org/10.1136/qshc.2002.003822

Brenner, R. J., & Bartholomew, L. (2005). Communication errors in radiology: A liability cost

    analysis. *Journal of American College of Radiology, 2(5),* 428–431.

    https://doi.org/10.1016/j.jacr.2004.08.009

Bureau of Labor Statistics. (2018). *Occupational employment statistics.*

    http://www.bls.gov/oes/current/oes291141.htm#st

Cary, A. H. (2001). Certified registered nurses: Results of the study of the certified workforce.

    American Journal of Nursing, 101(1), 44–52. https://doi.org/10.1097/00000446-

    200101000-00048

Castel, E., Ginsburg, L., Zaheer, S., & Tamin, H. (2015). Understanding nurses' and physicians'

    fear of repercussions for reporting errors: Clinician characteristics, organization

    demographics, or leadership factors? *BMC Health Services Research, 15*(326), 1–10

Cook, A., Hoas, H., Guttmannova, K., & Joyner, J. C. (2004). An error by any other name. *The American Journal of Nursing, 104*(6), 32–43. http://www.ncbi.nlm.nih.gov/pubmed/15187607

De Vires, E. N., Prins, H. A., Crolia, R. M., Den Outer, A. J., van Andel, G., van Helden, S. H., Schlack, W. S., van Putten, A., Gouma, D. J., Dijkgraaf, M. G. W., Smorenburg, S. M., & Boermeester, M. A. (2010). Effect of a comprehensive surgical safety system on patient outcomes. *New England Journal of Medicine, 363*(11), 1928–1937. https://doi.org/10.1056/NEJMsa0911535

Dea, N., Versteeg, A., Fisher, C., Kelly, A., Hartig, D., Boyd, M., Paquette, S., Kwon, B. K., Dvorak, M., & Street, J. (2014). Adverse events in emergency oncological spine surgery: a prospective analysis. *Journal of Neurosurg: Spine, 21*: 698-703

Dempsey, C., & Assi, M. J. (2018). The impact of nurse engagement on quality safety, and the experience of care, what nurse leaders should know. *Nursing Administration, 42*(3), 278-283

Department of Health and Human Services. (2008, February 12). *Patient Safety and Quality Improvement: Proposed rule.* Accessed May 16, 2019, from https://pso.ahrq.gov/sites/default/files/NPRM.pdf

Ebright, P., Urden, L., Patterson, E., & Chalko, B. (2004). Themes surrounding novice nurse near-miss and adverse event situations. *Journal of Nurse Administration*, *34*(11), 531–538. https://doi.org/10.1097/00005110-200411000-00010

Edwards, M. T. (2018). An assessment of the impact of just culture on quality and safety in US hospitals. *American Journal of Medical Quality, 33*(5), 502-508. doi: 10.1177/1062860618768057

Elder, N., Pallerla, H., & Regan, S. (2006). What do family physicians consider an error? A

    comparison of definitions and physician perception. *BMC Family Practice, 7*(73). doi:

    10.1186/1471-2296-7-3, http://www.biomedcentral.com/1471-2296/7/73

Fassett, W. E. (2006). Patient safety and quality improvement act of 2005. *Annals of*

    Pharmacotherapy, 40(5), 917–924. https://doi.org/10.1345/aph.1G285

Goodman, J. C., Villarreal, P., & Jones, B. (2011). The social cost of adverse medical events,

    and what we can do about it. *Health Affairs, 30*(4), 590–595.

    https://doi.org/10.1377/hlthaff.2010.1256

Hartnell, N., MacKinnon, N., Sketris, I., & Fleming, M. (2012). Identifying, understanding and

    overcoming barriers to medication error reporting in hospitals: A focus group study. *BMJ*

    Quality & Safety, 21(5), 361–368. https://doi.org/10.1136/bmjqs-2011-000299

Heard, G. C., Sanderson, P. M., & Thomas, R. D. (2012). Barriers to adverse event and error

    reporting in anesthesia. *Anesthesia & Analgesia, 114*(3), 604–614.

    https://doi.org/10.1213/ANE.0b013e31822649e8

Hobgood, C., Weiner, B., & Tamayo-Sarver, J. (2006). Medical error identification, disclosure,

    and reporting: Do emergency medicine provider groups differ? *Society for Academic*

    Emergency Medicine, *13*(1), 443–451. https://doi.org/10.1197/j.aem.2005.11.005

Hwang, J. I., & Park, H. A. (2014). Nurses' perception of ethical climate, medical error

    experience and intent to leave. *Nursing Ethics, 21(1),* 28-42.

    doi:10.1177/0969733013486797

Institute of Medicine (US), Committee on Quality of Health Care in America. (2000). *To err is*

    human: Building a safer health system. National Academies Press.

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century*. National Academies Press

Jeffe, D. B., Dunagan, W. C., Garbutt, J., Burroughs, T. E., Gallagher, T. H., Hill, P. R., Harris, C. B., Bommarito, K., & Fraser, V. J. (2004). Using focus groups to understand physicians' and nurses' perspectives on error reporting in hospitals. *Joint Commission Journal on Quality and Safety, 30*(9), 471–479 http://www.ncbi.nlm.nih.gov/pubmed/15469124

Landrigan, C. P., Parry, G. J., Bones, C. B., Hackbarth, A. D., Goldmann, D. A., & Sharek, P. J. (2010). Temporal trends in rates of patient harm resulting from medical care. *New England Journal of Medicine, 363*(22), 2124–2134. https://doi.org/10.1056/NEJMsa1004404

Lang, S., Garrido, V. M., & Heintze, C. (2016). Patients' views of adverse events in primary and ambulatory care: A systemic review to assess methods and the content of what patients consider to be adverse events. *BMC Family Practice, 17*(6). https://doi.org/10.1186/s12875-016-0408-0

Leape, L. L., Berwick, D. M., & Bates, D. W. (2002). What practices will most improve safety? *JAMA, 288*(4), 501–508. https://doi.org/10.1001/jama.288.4.501

Leape, L. L., Brennan, T. A., Laird, N., Lawthers, A. G., Localio, A. R., Barnes, B. A., Hebert, L., Newhouse, J. P., Weiler, P. C., & Hiatt, H. (1991). The nature of adverse events in hospitalized patients: Results of the Harvard Medical Practice Study II. *New England Journal of Medicine, 324*(6), 377–384. https://doi.org/10.1056/nejm199102073240605

Lightdale, J. R., Mahoney, L. B., Fredette, M. E., Valim, C., Wong, S., & DiNardo, J. A. (2009). Nurse reports of adverse events during sedation procedures at a pediatric hospital.

Journal of PeriAnesthesia Nursing, 24(5), 300–306.

https://doi.org/10.1016/j.jopan.2009.07.004

Ludwick, R., & Silva, M. C. (2003). Errors, the nursing shortage and ethics: Survey results.

Online Journal of Issues in Nursing, 8(3), 14–24

Makary, M. A., & Daniel, M. (2016). Medical error—the third leading cause of death in the US.

BMJ, 2016(353),i2139. https://doi.org/10.1136/bmj.i2139

Masotti, P., McColl, M. A., & Green, M. M. (2010). Adverse events experienced by homecare

patients: A scoping review of the literature . *International Journal for Quality in Health

Care, 22*(2), 115–125. https://doi.org/10.1093/intqhc/mzq003

McLaughlin, A., & Fetzer, S. J. (2015). The perceived value of certification by magnet and non-

magnet nurses. *The Journal of Nursing Administration, 45*(4), 194–199.

https://doi.org/10.1097/NNA.0000000000000184

Meints, A. (2000). Adverse drug event reporting and advance-nursing practice. *Clinical Nurse

Specialist*, *14*(6), 295–298. https://doi.org/10.1097/00002800-200011000-00014

Mittmann, N., Knowles, S., Gomez, M., Fish, J., Cartotto, R., & Shear N. (2004). Evaluation of

the extent of under-reporting of serious adverse drug reactions. *Drug Safety*, *27*(7), 477–

487

Moumtzoglou, A. (2010). Factors impeding nurses from reporting adverse events. *Journal of

Nursing Management, 18*(5), 542–547. https://doi.org/10.1111/j.1365-2834.2010.01049.x

Pahuja, S., Puri, V., Mahajan, G., Gupta, P., & Jain, M. (2017). Reporting adverse transfusion

reactions: A retrospective study from tertiary care hospital from New Delhi, India. *Asian

Journal of Transfusion Science, 11*(1), 6–12. https://doi.org/10.4103/0973-6247.200779

Prang, I., & Jelsness-Jorgensen, L. (2014). Should I report? A qualitative study of barriers to
    incident reporting among nurses working in nursing homes. *Geriatric Nursing, 35*(6),
    441–447. https://doi.org/10.1016/j.gerinurse.2014.07.003

Ridley, R. T. (2008). The relationship between nurse education level and patient safety: An
    integrative review. *Journal of Nursing Education, 47*(4), 149–156.
    https://doi.org/10.3928/01484834-20080401-06

Sanko, J. S., Young-Ju, K., & McKay, M. (2018). Adverse event reporting following simulation
    encounters in accelerated and traditional bachelor nursing students. *Nurse Education
    Today*, *70,* 34–39. http://doi.org/10.1016/j.nedt.2018.08.016

Shreve, J., Van Den Bos, J., Gray, T., Halford, M., Rustagi, K., & Ziemkiewicz, E. (2010). *The
    economic measurement of medical errors*. Society of Actuaries

Stratton, K. M., Blegen, M. A., Pepper, G., & Vaughn, T. (2004). Reporting of medication errors
    by pediatric nurses. *Journal of Pediatric Nursing, 19*(6), 385–392

Taylor, J. A., Brownstein, D., Christakis, D. A., Blackburn, S., Strandjord, T. P., Klein, E. J., &
    Shafii, J. (2004). Use of incident reports by physicians and nurses to document medical
    errors in pediatric patients. *Pediatrics, 114*(3), 729–735

Tennankore, K. K., d'Gama, C., Faratro, R., Fung, S., Wong, E., & Chan, C. T. (2015). Adverse
    technical events in home hemodialysis. American Journal of Kidney Disease, *65*(1), 116–
    121. https://doi.org/10.1053/j.ajkd.2014.08.013

Thomas, E. J., Studdert, D. M., Burstin, H. R., Orav, E. J., Zeena, T., Williams, E. J., Howard, K.
    M., Weiler, P. C., & Brennan, T. A. (2000). Incidence and types of adverse events and
    negligent care in Utah and Colorado. *Medical Care, 38*(3), 261–271.
    https://doi.org/10.1097/00005650-200003000-00003

Uribe, C. L., Schweikhart, S. B., Pathak, D. S., Dow, M., & Marsh, G. B. (2002). Perceived

   barriers to medical-error reporting: An exploratory investigation. *The Journal of*

   Healthcare Management, 47(4), 263–279.

   http://www.ncbi.nlm.nih.gov/pubmed/12221747

Van Delft, E. A. K., Schepers, T., Bonjer, H. J., Kerkhoffs, G. M. M. J., Goslings, J. C., &

   Schep, N. W. L. (2017). Safety in the operating room during orthopedic trauma surgery—

   incidence of adverse events related to technical equipment and logistics. *Archives of*

   Orthopaedic and Trauma Surgery, 138:459-462. https://doi.org/10.1007/s00402-017-

   2862-0

Wachter, R. (2010). Patient safety at 10 years: How far have we come? What's next? *OR*

   Manager, 26(3), 5–7

Wagner, L. M., Harkness, K., Hébert, P. C., & Gallagher, T. H. (2012). Nurses' perceptions of

   error reporting and disclosure in nursing homes. *Journal of Nursing Care Quality, 27*(1),

   63–69. https://doi.org/10.1097/NCQ.0b013e318232c0bc

Waite, S., Scott, J. M., Drexler, I., Martino, J., Legasto, A., Gale, B., & Kolla, S. (2018).

   Communication errors in radiology - Pitfalls and how to avoid them. *Clinical Imaging,*

   51, 266–272. https://doi.org/10.1016/j.clinimag.2018.05.025

Wakefield, D. S., Wakefield, B. J., Uden-Holman, T, et al. (1999). Understanding and comparing

   differences in reported edicaion administration error rates. *American Journal of Medical*

   Qualty. 14:73-80

Woods, D. M., Thomas, E. J., Holl, J. L., Weiss, K. B., & Brennan, T. A. (2007). Ambulatory

   care adverse events and preventable adverse events leading to a hospital admission.

   Quality Safety Health Care, *16*(2), 127–131. https://doi.org/10.1136/qshc.2006.021147

World Health Organization. (2009). *Conceptual framework for international classification for*

    patient safety. http://www.who.int/patientsafety/taxonomy/icps_full_report.pdf

World Health Organization. (2012). *Definitions of key concepts from the WHO patient safety*

    curriculum guide (2011).

    http://www.who.int/patientsafety/education/curriculum/course1a_handout.pdf

Table 1. Demographic characteristics of participants

Variable		N	Percentage
Gender			
Female		397	88.4
Male		52	11.6
Ethnicity			
Hispanic or Latino		68	15.1
Not Hispanic or Latino		381	84.9
Age			
Range	24 - 68		
Mean	42.9		
Median	42		
Education			
High School + vocational training		6	1.3
Some college, no degree		9	2.0
Associate degree		31	6.9
Bachelor's degree		282	62.8
Graduate degree		121	27.0
Years in nursing profession			
Less than 1 year		15	3.3
1 – 5 years		105	23.4
6 – 10 years		98	21.8
11 – 15 years		109	24.3
16 – 20 years		42	9.4
21 years or more		80	17.8
Certified Nurse			
Yes		359	80.0
No		90	20.0
Professional Membership			
Yes		345	76.8
No		104	23.2
Nursing Practice			
LVN		20	4.5
RN		386	87.5
APRN		15	3.4
CRNA		20	4.5
Current Work Role			
Staff Nurse		393	87.5
Nurse Educator		18	4.0
Management/Administrator		38	8.5
Employment Status			
Full-time		388	86.4
Part-time		61	13.6
Work hours per week			
Less than 20 hours		18	4.0
20 – 39 hours		264	58.8
40 – 59 hours		155	34.5
60 – 79 hours		12	2.7

Table 2. Chi-Square Test Results Comparing Agreement of Reporting Events Related to five clinical scenarios representing events that as a result of omission, near-missed, no harm, with reversible harm and with irreversible harm and Whether a Nurse Would Report Such Incidents

Five proposed clinical scenario: Agree or Disagree*:	Would you report?	X^2 (df)	p-value
A patient missed a mid-day dose oral antibiotics because he was not in his room. (Omission)	Yes or No	105.59 (4)	**< 0.001**
D5% IV fluid bags incorrectly stocked in Pyxis drawer labeled for 0.9% NS. (Near-Missed)	Yes or No	50.52 (4)	**< 0.001**
Acetaminophen administered to a wrong patient. Patient did not experience any harm. (No Harm)	Yes or No	48.23 (4)	**< 0.001**
A patient developed a badly infected IV site during hospitalization. The IV was removed and the patient eventually recovered. (Reversible Harm)	Yes or No	100.15 (4)	**< 0.001**
A patient fell and sustained a cerebral hemorrhage during hospitalization. Family declined surgical intervention. The patient died within a week from such injury. (Irreversible Harm)	Yes or No	60.19 (4)	**< 0.001**

*Note. * Categorized as: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree*

Table 3. Post Hoc Test results for participants' level of agreement with each clinical scenario and if they would report such incident.

Scenario	This is a Reportable Event (Levels of Agreement)	Observed Response (I Would Report This Event)	
		Yes	No
A patient missed a mid-day dose oral antibiotics because he was not in his room (Omission)	Strongly Disagree	6 (-2.3)	18 (2.3)
	Disagree	21 (-6.8)	88 **(6.8)**
	Neutral	27 (-3.4)	59 (3.4)
	Agree	86 (3.7)	56 (-3.7)
	Strongly Agree	74 **(7.6)**	14 (-7.6)
D5% IV fluid bags incorrectly stocked in Pyxis drawer labeled for 0.9% NS (Near-Missed)	Strongly Disagree	11 (-5)	3 (.5)
	Disagree	15 (-3.7)	11 **(3.7)**
	Neutral	21 (-3.6)	13 (3.6)
	Agree	146 (-2.3)	39 (2.3)
	Strongly Agree	183 **(6.2)**	7 (-6.2)
Acetaminophen administered to a wrong patient. Patient did not experience any harm. (No Harm)	Strongly Disagree	12 (-1.8)	2 (1.8)
	Disagree	3 (-3.9)	2 **(3.9)**
	Neutral	4 (-5.0)	3 **(5)**
	Agree	100 (-1.2)	7 (1.2)
	Strongly Agree	310 **(4.0)**	6 (-4.0)
A patient developed a badly infected IV site during hospitalization. The IV was removed and the patient eventually recovered. (Reversible Harm)	Strongly Disagree	12 (-3.5)	10 (3.5)
	Disagree	13 (-6.1)	18 **(6.1)**
	Neutral	16 (-3.9)	13 (3.9)
	Agree	125 (-1.9)	36 (1.9)
	Strongly Agree	203 **(8.3)**	3 (-8.3)
A patient fell and sustained a cerebral hemorrhage during hospitalization. Family declined surgical intervention. The patient died within a week from such injury. (Irreversible Harm)	Strongly Disagree	10 (-3.7)	2 (3.7)
	Disagree	8 (-6.1)	3 **(6.1)**
	Neutral	18 (-2.6)	2 (2.6)
	Agree	49 (1.1)	0 (-1.1)
	Strongly Agree	355 **(4.3)**	2 (-4.3)

Note. Adjusted residuals in parentheses next to observed frequency.

Table 4. Chi-Square Analyses of Number of Adverse Event Reported in the Past 12 Months and Frequency of Three Types of Adverse Events Reported with Levels of Education, Certifications, Memberships, Work Positions, and Level of Nursing Practice

Adverse Events	Pair	$F_e \geq 5$	X^2 (df)	*p*-value	Cramer's V
Number of adverse events reported	**Education (Degree Level)**	No	17.57 (8)	**.025**	.14
	Professional Certification	No	7.47 (4)	.113	.13
	Professional Society Member	No	5.81 (4)	.214	.11
	Role (Work Position)	No	19.32 (8)	**.013**	.15
	Level of Nursing Practice	No	23.29 (8)	**.003**	.17
Frequency of "near-missed events" reported	**Education (Degree Level)**	Yes	17.73 (6)	**.007**	.14
	Professional Certificate	Yes	6.45 (3)	.092	.12
	Professional Society Membership	Yes	1.38 (3)	.711	.06
	Role (Work Position)	No	8.11 (6)	.230	.10
	Level of Nursing Practice	No	6.72 (6)	.347	.09
Frequency of "adverse event with no potential harm" reported	**Education (Degree Level)**	Yes	17.60 (6)	**.007**	.14
	Professional Certificate	Yes	2.20 (3)	.533	.07
	Professional Society Membership	Yes	2.18 (3)	.536	.07
	Role (Work Position)	No	9.86 (6)	.131	.11
	Level of Nursing Practice	No	4.67 (6)	.586	.07
Frequency of "adverse event with potential harm, none results" reported	Education (Degree Level)	No	12.48 (6)	.052	.12
	Professional Certificate	No	10.58 (3)	**.014**	.15
	Professional Society Membership	No	0.23 (3)	.972	.02
	Role (Work Role)	No	4.11 (6)	.662	.07
	Level of Nursing Practice	No	4.65 (6)	.589	.07

Note. Fe denotes expected frequency in a category (cell).

Effect size cutoffs for small, medium, and large are .07, .21, and .35, respectively.

Number of adverse event reported categorized as: No, 1-2, 3-5, 6-10 and 11 or more.

Frequency of adverse event reported categorized as : Never/Rarely, Sometimes, Most of the Times and Always.

Table 5: Post Hoc Test Results Comparing Number of Adverse Event Reported and Nurses' Education Level, Work Role, and Level of Practice

Number of adverse events reported	Degree			Work Role			Practice	
	Vocational to Associate	Bachelor's	Graduate	Staff Nurse	Nurse Educator	Administrator	RN	APRN
No AE	13 (2.4)	33 (-3.1)	25 (1.7)	58 (-1.6)	5 (1.4)	8 (0.9)	49 (-3.2)	12 (3.4)
1 - 2	18 (-1.6)	157 (3.1)	50 (-2.3)	203 (1.7)	10 (0.5)	12 (-2.4)	190 (-1.5)	19 (0.5)
3 - 5	10 (-.6)	71 (0)	32 (0.4)	101 (0.7)	3 (-0.8)	9 (-0.2)	107 (2.7)	4 (-2.0)
6 - 10	4 (0.9)	12 (-1.8)	10 (1.4)	19 (-2.3)	0 (-1.1)	7 (3.5)	26 (2.0)	0 (-1.5)
11 or more	1 (-0.4)	9 (0.1)	4 (0.1)	12 (-0.2)	0 (-0.8)	2 (0.8)	14 (1.4)	0 (-1.1)

Note. Numbers represent observed frequencies
Adjusted residuals appear in parentheses below observed frequencies
Positive Adjusted Residual = Obs. > Exp (the observed residual is greater than expected
Negative Adjusted Residual = Obs. < Exp (the observed residual is smaller than expected

Table 6: Post Hoc Test Results Comparing Frequency of three types of Adverse Events and Nurses' Level of Degree and Status of attaining Nursing Specialty Certifications

	Frequency of Reporting	Nursing Degree			Certification	
		Vocational to Associate	Bachelor's	Graduate	Non-Certified	Certified
Near-Missed Events	Never/Rarely	8 (1.0)	34 (-.7)	16 (.1)		
	Sometimes	11 (.4)	52 (-2.3)	35 (2.2)		
	Most of the time	13 (-2.7)	152 (3.6)	48 (-2.0)		
	Always	14 (2.4)	44 (-1.6)	22 (.1)		
Events with No Potential Harm	Never/Rarely	10 (1.8)	32 (-1.6)	18 (.6)		
	Sometimes	7 (-1.3)	58 (-1.6)	38 (2.6)		
	Most of the time	16 (-1.7)	146 (3.0)	46 (-2.1)		
	Always	13 (2.1)	46 (-.8)	19 (-.6)		
Events Could Harm Patients but Do Not	Never/Rarely				7 (1.7)	13 (-1.7)
	Sometimes				13 (-.6)	61 (.6)
	Most of the time				34 (-2.5)	189 (2.5)
	Always				36 (2.5)	96 (-2.5)

Note. Numbers represent observed frequencies
Note. Adjusted residuals appear in parentheses below observed frequencies
Positive Adjusted Residual = Obs. > Exp (the observed residual is greater than expected
Negative Adjusted Residual = Obs. < Exp (the observed residual is smaller than expected