

Safety Management System for Lone Working Person in Industry

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Abstract: *The purpose of this study was to investigate the risk of working alone (lone working) in the home industry and the benefits of implementing safety voice (speaking up behavior), to identify opportunities for effective intervention, with the goal to retain satisfied Industries. It is without a doubt that the employer must protect and take care of its employees by providing necessary facilities and ensuring the workstation is safe. Significant concepts emerged from this literature review on lone workers: risk perception of lone Industries workers; employee safety voice; organizations preventive and protective strategies for lone Industries employees; and focus groups of home visiting health care providers. All have substantial years of practical experience in delivering home health care to young patients and the aged communities. The participant's responses to the interview and survey question revealed the safety concerns, occupational hazards at the patient's home, and the need for employers to assess risk management on patients' home before these workers visit the homes.*

Keywords: Safety

I. INTRODUCTION

Although no strict laws are covering lone workers, employers are to ensure an employee classified as a lone employee, should be provided a safe working environment. In the industry worker, employee, security detail(s) especially shift-work staff, could face the dangers of attack or other job-related incident without immediate assistance. As the number of lone workers is increasing in the Industries community, safety continues to emerge as a significant concern for this group of workers.

Prior studies estimated that the rate of occupational fatalities in the industrially developing countries is at least two to five times higher than the industrially developed countries such as North America and Western Europe (Concha-Barrientos et al., 2004).

1.1 Purpose of Study and Synopsis

The purpose of this study was to establish the risk of working alone in the home industry and the benefits of implementing safety voice (speaking up behavior), to identify opportunities for effective intervention, with the goal to retain satisfied home health clientele. The study will seek to understand practical solutions to manage risks and improve both worker and patient safety.

1.2 Statement of the Problem

The problem for this research arises from need of safety measures or safe practices for lone workers in the home health nursing industry. It is without a doubt that an employer must protect and take care of its employees by providing necessary facilities and ensuring the workstation is safe. However, most employees with a focus on lone workers are spending much time in the field working all by themselves. Most of the risks go unassisted, which places lone workers at higher risk of facing the safety risks given the fact that they work alone with no one to assist them in the workplace in case of an emergency.

1.3 Research Questions

Using this research and interviews, this thesis answered the following research questions:

- How do characteristics of the work environment moderate levels of job-related violence experienced by employees?
- In what ways can Industries organizations and employees identify and mitigate lone-working risk?
- How can the Industries organizations implement employee safety voice practice to improve lone-worker safety?

1.4 Significance of the Study

The results from this research, established an awareness on the risks of lone working in the industry. Additionally, the results could be useful in suggesting efficient, safe lone-working measures and the use of employee safety voice to strengthen employee commitment to safe practices and awareness.

1.5 Definition of Terms

Lone workers: A lone worker can be anyone who works alone in a fixed facility or away from his or her regular base (Coyle, Sleeman, & Adams, 2017). Mostly, the definition applies to those who work alone in factories, warehouses, hospitals. This description can also refer to traveling workers in construction, utilities, maintenance and repair, agriculture, and other fields. Two types of safety management that commonly used in organizations include the traditional (program) and systematic approaches (Herrero et al., 2002). The following sections provide a brief description of these approaches.

1.6 Safety Climate:

An objective measurement of attitudes and opinions toward Occupational Health & Safety issues (Coyle, Sleeman & Adams, 2017). It refers to the shared idea that the workers have when they are describing their organizational practices, procedures, and policies as they relate to safety within their organization (Griffin & Neal, 2010). Safety Climate is a measurable aspect of Safety Culture.

1.7 Risk Assessment:

Risk assessment, refers to identifying potential hazards in the workplace as well as the likelihood that they will occur. Risk assessment is a significant part of health and safety management. The Occupational Safety and Health Administration (OSHA) advises employers to instrument best practices reducing hazards in the workplace (2017).

1.8 Hermeneutics

Hermeneutics is derived from the Greek verb, hermēneuein, to interpret and the noun hermēneia, interpretation and its aim is “to make meaning intelligible” (Grondin, 1994).

II. LITERATURE REVIEW

Working Alone In- Industries

Going through the previous literature on lone workers about their risk perception and the need to minimize the risks, the library database and various publications of journals and articles undertaken in the early stages of the research. Most of the literature cited are publications in major countries such as the U.S. and U.K., however efforts were made to include works of literature from other countries to allow for comparison.

The term “lone- worker,” is used to define those workers who work either occasionally or regularly without immediate support from the colleagues or supervisors (NHS, 2005).

Little research has been done on lone workers (Huang et al., 2013). There has been little research done to examine the safety climate of lone workers given the fact that lone working is becoming more prevalent over the years across different industries.

The work organization as proposed by the National Institute for Occupational Safety and Health (NIOSH) and literature on lone workers is the base for the conceptual framework, below is a model showing key factors that identify safety hazards in home health. The hypothesized model was adapted from the NIOSH/NQRA organization of work

Framework.NAHC, 2001; Szasz, 1990). Making use of the resources from the NIOSH/NORA Organization of Work, we can break down these concepts into practical means for this study.

Lone Workers in General Industry

There have been legal frameworks that hold employers responsible for the safety of their employees always through creating safety policies that workers need to attend to at work. For instance, the Health and Safety Act of 1974 (UK) set out the legal framework that would ensure the safety and welfare of employees are adhered to while at the workplace (NHS, 2017). The Act of 1974 gave the structure on to protect workers, although there is no specific rule for lone workers.

Lone workers must deal with these issues independently with only limited access to timely assistance from co-workers or supervisors, which is more obtainable in non-lone working situations (HSE, 2009).

As the research progresses, a truck driver would be part of the research process, solely for expanding the knowledge pool on lone working in high risk industries as well as participants from the home health care industry. Lone workers can be grouped into these 3 types:

Public-facing lone workers:

Public facing lone workers are those who meet and face the public daily. Lone employees sometimes have no idea what the working conditions may be, the task/job, or the background of the people they could face (Young, 2010).

Examples of public facing lone workers:

- Retail Workers
- Social Workers
- Housing Officers
- Care Workers
- Probation Officers
- Medical Workers

Mobile lone workers:

Mobile lone workers are those who do not work in a fixed location and could, therefore, be at risk from various elements including the public, their environment, and the tasks they are performing. Some mobile workers are at more risk resulting from the public, and others a higher environmental risk (Young, 2010).

Here are a few examples of lone mobile workers:

- Heavy goods vehicle operators
- Couriers
- Construction Equipment operators
- Inspectors
- Surveyors
- Security personnel

Fixed-site lone workers:

Fixed-site lone workers are those who work at a fixed location and often have little contact with other people. These sites usually include high-risk areas such as building sites and factories (Young, 2010).

Examples of fixed-site lone workers:

- Nurses
- Site Maintenance Officers
- Shift Workers
- Machine Operators
- Facilities Managers

What is OSHA and its responsibilities?

The Occupational Safety and Health Administration (OSHA) is governed by the United States Department of Labor (DOL), that is made solely to assure safe and healthy working conditions for both career men and women by enforcing standards and making available training and assistance (US DOL, 2007).

OSHA Regulations

OSHA's regulations for tunnels, shafts, chambers, and passageways (29 CFR 1926.800) requires, "Any employee working alone in confined spaces, underground in a hazardous location, who is both out of the range of natural unassisted voice communication (US DOL, 2007). Not under observation by other persons, shall be provided with an effective means of obtaining assistance in an emergency (US DOL, 2007). OSHA's General Duty Clause states, in Section 5(a) 1, "each employer shall furnish to each of his employee's employment, and a place of work, which is free from recognizable hazards, likely to cause physical harm to the employees.

The Risks of Lone Working

Achieving the category of lone workers, there should be an individual risk assessment on each employee or task performed ("Risks of Lone Working - How to Identify Risks and Prepare Employees," 2016). Some risks are present in all the groups, while, some are specific to just one. Listed below are a few risks associated with lone working.

Sudden illness or accident

- Violence, threats, or abuse
- Theft or intruders
- Driving-related incidents
- Extreme weather

Although lone working spans across numerous fields such as, Industries, construction, manufacturing, security and many others, the focus of this study is on Industries workers, which includes nurses, therapist, and social workers.

Accident/Incidences Rates among Lone Workers

The number of lone worker accidents has grown by 13% over the last five years according to National Health Service of UK (NHS, 2017), which has continued to raise questions about how safe the solitary work environment is. For instance, for truck drivers, NHTSA (National Highway Traffic Safety Administration) reports that out of the 3,300 fatalities and 74,000 injuries that occur on the road involve truck drivers who happen to be lone workers.

The areas include the micro system where the individual is mentality shaped by the environment and the people whom they interact with (Zohar, 2010). The basis of this research will be to examine the Ecosystem as a way of improving the working environment for lone workers by strengthening the safety climate.

For lone workers, they report that they feel so much constrained in the work environment, which makes them so far restless, which may cause the working environment to be more turbulent (Christian et al., 2009).

There may be diverging opinions on lone working, but what can be agreed on is the fact that the working environment is changing rapidly, a point that must be observed from different angles. The need to respond to these changes presents even a more significant challenge to the governments of different countries.

Industries Challenges to Employee Safety Voice

Critical upward feedback and employee voice concerning work issues and problems are imperative in the hospital setting, where employees deal with matters of life and death daily (Tucker & Edmondson, 2003).

The hospital environment poses unique industry challenges. Multiple hierarchies of professions, on both the clinical side and the administrative side, make directing and organizing the work challenging (McAlearny, 2006). The core of a hospital's staff consists of professionals who learned socialization elsewhere pre-employment, which leads to the strong professional identification and weak organizational identification (Ramanujam & Rousseau, 2006). Such strong professional identification often results in little unity of purpose (Nembhard et al., 2009).

Researchers at the Institute of Medicine (2004) reported leadership in Industries organizations typically regard staff not as an asset, but as a cost; such dysfunctional work environments have put staff at odds with each other, leading to “record low levels of trust” (p. 823).

Industries leaders tend to stress cost efficiencies, while clinical professionals emphasize patient care during their interactions, which fosters the perception that goals are not only separate but also conflicting, leading to further breakdowns in communication and collaboration (Nembhard et al., 2009).

Industries workers tend to patch problems quickly because they do not have time to resolve underlying causes of problems arising in daily activities (Tucker & Edmondson, 2003).

The problem-solving behaviour witnessed in the Tucker and Edmondson (2003) study of nurses across multiple hospitals concentrated on the immediate needs of the patients. Nurses rarely assessed or remedied underlying causes, or even reported problems and errors to supervisors. There was also a tendency for individuals to correct others’ mistakes quietly, again, without reporting these to the person making a mistake to supervisors.

The behaviour demonstrated how collaborative learning does not occur naturally in Industries due to the self-censoring of low-status individuals out of fear of negative repercussions of speaking up (Nembhard & Edmondson, 2006).

Leaders must create boundary-spanning processes to address chronic and powerful communication barriers between subcultures—about a hospital, between professions and layers in the organizational hierarchy (Schein, 2004). Leaders need to align the diversity of subcultures to overcome problems with integration and coordination (Schein, 2004).

The Lone Worker’s Challenge

Lone workers should be on the lookout for potential risks they face and to be compliant with organizational safety guidelines (Accident Analysis & Prevention, 2013). In the face of dangers, if the safety perception places at the highest rank by the company even though they are away from direct supervision, risky situations will have lesser effects. Safety climate can potentially supplement the weaker impact of remote safety supervision for lone workers.

Lone worker situations prove to be challenging because there are almost no observation and real-time feedback about safe and at-risk behaviours of lone workers.

Considering the rapid change in the economic and technology climate, the prevalence of lone workers in today’s workforce, and the different risk causes associated with lone workers. It is essential to use a safety solution that equal to the task. To keep up with today’s quick-moving economy and technology, industries need to employ a safety checking that is scalable and full-proof (Huang et al. 2013).

Lone Workers’ Safety Climate/Culture’s view

Safety climate is a strong predictor of behavioural safety and occupational injuries, among lone workers given their sometimes risky and lone working conditions (Huang et al., 2013).

Specifically, if supervisors devalue an organization’s new policies about inclement weather and work schedules for safety and, subsequently, if they are not supportive of their workers’ compliance with the policies, the organization’s safety efforts will be less effective. Recently, trucking industry-specific (Huang et al., 2013) and utility industry-specific (Huang et al., 2013) safety climate scales for lone mobile workers was developed and validated.

Organizational safety climate has been defined as “a unified set of cognitions held by workers regarding the safety aspects of their organization (Young, 2010). Since then, this definition has been refined to indicate that there are several critical dimensions to consider when conceptualizing and measuring safety climate (Young, 2010).

Studies of safety climate on lone workers were performed by Zohar and Luria (2015) using a survey that is applied across different industries (Huang et al., 2014). Another research performed to tailor the research findings to the overall view on the safety climate for workers carrying out jobs alone. According to Zohar (2010), the safety climate can be generic across different industries, and but needs to fit specific work conditions. The definition of group safety climate will be the perception of a group of workers ‘view on work and the situation’ that may affect their ability to perform tasks.

Working Odd Hours

According to a report by NHE (2017), most workers work out of regular hours in isolated environments, which made them more vulnerable to risks. Most lone workers complicate the emergency system do not have a colleague on a site whom they can easily contact in case of an emergency. Another dimension noted to working out of regular hours is the fact that it takes place at night, which even complicates the risk nature of the work environment.

Mitigating the Risk with Lone Workers

In these days of the Internet, hot desking, and flexible working hours, it is common for workers to have to perform on their own, away from colleagues (Sanderson, 2016). It's fair to say that most employers will have lone workers (Sanderson, 2016). Understanding the need for lone worker safety will enable employers to carry out risk assessments on each job type and ask lone employees for their input on job conditions and ways to improve (Sanderson, SHP Online | Health and Safety News, Legislation, PPE, Training and CPD, 2016).

Developing a Lone Worker Policy Program

Employers need to have a system that is effective, and functions in minimizing risks to lone workers (Sanderson, "The challenges of managing lone workers," 2016). The safety system such as policy needs to be clear, an easy to understand policy document that sets the requirements for the board, line managers and the lone workers themselves (Sanderson, "The challenges of managing lone workers," 2016). Systems are 'to the point' and reviewed yearly.

- Risk assessments to discover tasks that are safe for lone workers
- Training of lone employees in emergency response.
- Have an emergency or action plan in case of an emergency.
- Set limits for lone working (hours, nature of job, environment).
- Require supervisors to make regular visits to observe the lone employee.
- Ensure two-way open communication between lone workers and supervisors by phone or radio (Sanderson, "2016).
- Use of automatic warning devices that alert others if the lone worker does not check back in an interval.
- Ensure lone workers have returned to fixed base after completing a task.

Those lone workers who are not assessing risks should be identified and targeted for added training or support (Sanderson, "The challenges of managing lone workers," 2016).

To have an effective lone working policy, both employees and employers inclusive of managers, supervisors, should be able to identify individual and organizational responsibilities.

- Identification of risks or hazards associated with the nature of the job.
- Conduct and document a risk/hazard assessment for the specific type of work or job location relating to lone employees.
- Communicate the results of the risk assessment performed to all affected workers.
- Provide procedures in a lone employee's area of responsibility, to eliminate or minimize identified risks.
- Develop efficient safety systems for a two-way communication for lone workers.
- Determine and document when working alone is permitted and prohibited and ensure this is communicated efficiently to all workers.
- Schedule potentially hazardous jobs at times when supervisors and a second employee can assist.

Consider protection to consist of two components:

Prevention and Response.

Achieving prevention goes by infusing ways in which employees avoid stressful situations in the first place. The response is in the area where preventive means fail. Prevention can also reduce the number of occasions where a lone worker will get into a position, which will result in their harm, 'reduce' is different from 'eliminate,' so there will be a need for response services. Response to prevention in isolation is still insufficient; adding training and management will result in a culture of working safe, which will be "protection".

Prevention Preventive methods should start with a well detailed and grounded policy leading to measurable procedures, developed in consultation with lone working employees, managers, and supervisors. Response Preventive methods do fail from time to time; an employee will need a valid emergency response.

Training

Training binds prevention and response together. Training can cover these following parts:

- Application of policies and procedures
- Adequate use of Lone Worker Response devices
- Awareness and how to avoid job- hazards.
- Management of hazardous job conditions
- Individual responsibility for personal safety

Management

Proper management must sufficiently balance the organizational needs against the needs of the employee. The organization must protect the structure within its legal limits, its reputation, and effectiveness while protecting the individual employees that work alone in communities' Industries homes, other workplaces or transit between facilities.

A manager with responsibility for safeguarding lone workers needs to consider many factors; among them:

- How to achieve the best protection for both the organization and Lone Workers without jeopardizing the job?
- What is the nature of the task in the facility, and can it be contracted?
- Training and results, how will it be delivered?
- Will lone workers adhere to organizational procedures and will they approve and make use of a lone worker response service?
- Managing contracts and delivery of reports.
- Review Lone workers regularly

Personal Factors Influencing Non-Compliance with Safety Procedures

Worker Demographics

Studies by the CDC show that the industry worker demographics in the tree care industry consist of 99% males, with 70% being of white, non-Hispanic ethnicity. The CDC found that the median age is about 45 years old, with 44% being between 25 to 44 years old and another 44% being over 45 years of age (CDC, 2009). A difficult factor of collecting industry and worker demographics of the tree care industry is because of how tree care is categorized currently by the Bureau of Labor Statistics (BLS) and U.S. Occupational Safety and Health Administration (OSHA).

Perceived Factors Influencing Non-Compliance with Safety Procedures

Production Demand Prioritization

A study by Jiang et al. (2015) on conditions that cause construction workers to choose unsafe behaviors viewed the overall organization from a systems approach. This was done to understand the repercussions of safety conditions with varying priority. In this study by Jiang et al. (2015), it was found that production time is lost from an increase in the occurrence of incidents.

This reduction of incidents, from management external influence, also enables for more production time to become available in the future. This research concluded that safety and productivity are reliant on each other, management has a significant role in worker's safety awareness, and safety performance is best enhanced by being proactive rather than reactive (Ball et al., 2020; Jiang et al., 2015).

The first hypothesis of this research study is that the older workforce will be more prone to non-compliance if they perceive an increase in production pressure. This hypothesis is based on literature from a study by Shultz et al. (2010) that determined the older workforce may tend to perceive a higher production demand stress because the job tasks do not accommodate the aging worker's needs.

Risk Association with Compliance

Safety protocols are designed to minimize the probability that a worker will experience an incident. However, there are often situations in uncontrollable work environments that are perceived by workers to be riskier if fully complying to safety procedures. For instance, using a trim saw with one hand instead of both hands is considered a forbidden practice by safety professionals (Lind & Ricketts, 2009). This is because there is a higher risk of cutting your other guiding hand when it is in contact with the wood being cut and not also controlling the saw- see 1910.266(e)(2)(viii) of OSHA's Logging Operations (OSHA, 2014).

External Factors Influencing Non-Compliance with Safety Procedures

Relevance of Training and Information in the Field

A study done by Ball et al. (2020) on the review of incidents in arboriculture found that compliance with safety procedures was one of the greatest challenges. This challenge is because the American National Standard for Arboriculture Operations – Safety Requirement (ANSI Z) needs to constantly be updated as new technology and techniques are discovered in the tree care industry (Ball et al., 2020).

Management Presence

Management's leadership plays a critical role in an organization's safety compliance because frontline managers act as the middlemen between upper management, and workers in the field (Biggs et al., 2013; Bosak et al., 2013). Frontline managers are expected by upper management to communicate the organization's values and mission through commitment and performance.

The study on safety climate dimensions as predictors for risk behavior found that management presence has an influential role of leading workers in a safe manner, especially when there is high production demand (Bosak et al., 2013).

Management of Lone Workers

An inconsistency in safety commitment between managers has been found to weaken safety culture (Tappura et al., 2017). Tappura et al. (2017) noted in Managers' viewpoint on factors influencing their commitment to safety: An empirical investigation in five Finnish industrial organizations that distributed workers noticed the differences between workers who work in physical relative proximity to another and others that work alone. Workers are more likely to ask for help when they know which colleague has the skills, resources, and the ability to assist (Nielsen et al., 2019). These studies support the assumption that fellow workers act as an external influence on other workers' safety compliance. The fifth hypothesis of this research study is that lone workers will be more likely to report non-compliance to a fellow worker than to their manager.

III. METHODOLOGY

This research further investigates the system dynamics of compliance with procedure and lone workers in high-risk industries. Research questions were explored by asking qualitative and quantitative scripted interview questions that are shown in Appendix A. The tree care company that aided in fulfilling the participant requirement for this study will not receive any raw data but will be provided the results of this study.

Research Question 1: What factors most affect lone workers' compliance with safety procedures in the tree care industry?

An electronic survey was distributed through Google Forms containing all questions from Table 19, Table 20, Table 21 in Appendix A of this paper. Likert scale response data served to find statistical significance in correlations given different survey data results from personal, perceived, or external influences. Continuous data and some of the open-ended response type questions in the personal influence section was employed to test if age groups cause significant splits when applied as an independent variable to the data.

Data Analysis for Research Question 1

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Data analysis for hypotheses 1.1 through 1.5 formed tested correlations between the respective interview questions by using an Ordered Chi Squared Test for Independence. This Ordered Chi-Squared Test took into account the level of satisfaction and other ordered variables like age. This Test of Independence was performed on the pairs of survey questions analyzed in each of the hypotheses.

Hypotheses for Research Question 1

Hypothesis 1.1:

Hypothesis 1.1: There is a Direct Correlation between Age and Non-Compliance from Perceived Production Pressure.

- H0: No correlation exists between age and non-compliance from perceived production pressure.
- H1: A significant correlation ($\alpha = 0.05$) exists between age and noncompliance from perceived production pressure.

Hypothesis 1.2

Hypothesis 1.2: There is a Correlation between Workers who have been Involved in an Incident and the Likelihood of Complying when Compliance Increases Perceived Risk.

- H0: No correlation exists between incident involvement and likelihood of comply when compliance increases perceived risk.
- H1: A significant correlation ($\alpha = 0.05$) exists between incident involvement and likelihood of comply when compliance increases perceived risk.

Hypothesis 1.3

Hypothesis 1.3: Employees who Feel they get Enough Hands-on Involvement from Management to Meet their Needs are more Inclined to Comply with Safety Procedures, No Matter the Perceived or External Influences.

- H0: No correlation exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker in their job title complying with safety procedures.
- H1: A significant correlation ($\alpha = 0.05$) exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker in their job title to complying with safety procedures.

Hypothesis 1.4

Hypothesis 1.4: Workers that Feel they Receive Enough Management Support are More Likely to Report to Managers about Not Complying with Safety Procedures.

- H0: No correlation exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker reporting to managers about non-compliance.
- H1: A significant correlation ($\alpha = 0.05$) exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker reporting to managers about non-compliance.

Hypothesis 1.5

Hypothesis 1.5: Lone-Workers are more Likely to Report Non-Compliance to a Fellow Worker than to their Manager.

- H0: No correlation exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker reporting to managers about non-compliance.
- H1: A significant ($\alpha = 0.05$) positive correlation exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker reporting to managers about noncompliance. Additionally, a significant ($\alpha = 0.05$) inverse correlation exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker reporting to a co-worker about non-compliance.
- H1: A significant ($\alpha = 0.05$) inverse correlation exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker reporting to managers about noncompliance.

Additionally, a significant ($\alpha = 0.05$) positive correlation exists between employees who feel they get enough hands-on involvement from management to meet their needs and the likelihood of a worker reporting to a co-worker about non-compliance.

Research Question 2: What are Lone Workers' Shared Perspective on Safety Procedure Compliance in Tree Care?

Interview questions for research question 2 were conducted over the phone and through the electronic survey. The interview script included all questions from Table 19, Table 20, and Table 21 in Appendix A. Open-ended response questions were used to find important topics relating to personal, perceived, and external influencers of safety compliance in tree care. Likert-scale and quantitative responses were used to find significant factors that influence compliance for lone workers in the tree care industry.

Data Analysis for Research Question 2

Calls were recorded and transcribed for analysis. The phone calls and electronic survey responses were combined and analyzed together. Open-ended responses were categorized for each question. The results serve to answer what factors may not have been mentioned in the Likert scale questions. This provides new discoveries to be studied in future research about lone-worker non-compliance in the tree care industry.

Research Question 3: How can Managers Use these Factors and Perceptions to Improve Safety Compliance for Lone Workers?

Answering the previous two research questions will lead us to answer the third research question on how managers can enhance safety procedure compliance with lone workers in the tree care industry. Inductive reasoning was used to link themes and responses in results to better understand how interactions between factors influence safety procedure compliance.

Data Analysis for Research Question 3

Recommendations on how managers can improve compliance among lone workers were inferred through the understanding of why lone workers might not comply with safety procedures.

Case study

Participant Demographic Information

Table 1 summarizes the demographic information of the survey study participants. Majority (66.7%) of the participants were male, and 66.6% were age 35 years and older; 44.4% equal number of workers work in both city and rural parts. Seventeen of the interviewees who fully participated and worked as home health nurses were either certified nursing assistants, occupational therapists, certified occupational therapist or physical therapist, who all acknowledged the fact that there are risks home nurses face while on the job. A total of 9 of 17 study participants responded to the survey link and agreed to participate in survey provided by the researcher, while 8 participants did not proceed with the survey but the interview process only.

Sample Description

Structured interviews were conducted with a sample $N=17$. The present sample exhibits a variety of professions throughout the industry as well different levels of experience ranging from few months to up to three decades. The variety assisted the researcher to generate insightful data to support the present investigation. The data generated through the structured interviews, aimed at understanding the risks and challenges lone workers face, the perception of the target population concerning their job, procedures and organizational processes integrated and recommendation to cope with safety issues. Emerged themes and categories were thoroughly discussed below.

Question1:What is your perception of lone working in this industry and are the read equate procedures to aid the safety or safe working practices of lone employees?

The analyst is of data resulted in the emergence of a theme defined as "Perception". The latter theme described various ways on how individuals perceive their work. The first category which was identified under such the theme was the lack of safety.

Respondent #1: My perception for working alone, has it ties with ones' experience. If the individual isn't experienced in this field of work, it could be a real fright ending or deal. Especially, going to places you have never been or know.

Respondent #2: "I feel there isn't enough safety measures to protect us workers in the Home Health care industry."

Respondent #3: There isn't enough safe working practices or ways to protect workers in this field. It is more of an alone situation in these cases."

Respondent #4: Plays it safe while you work. No job is free of risk or hazards,

Respondent #6: The risks most times over had over the safety measures put in place, and that indicates that there aren't always enough safety guidelines put out for us.

Respondent #9: There is adequate safety measures taken to ensure we are safe when out in the field. I do enjoy working alone.

Question 2: What is the perception of working alone in this industry and are there adequate procedures to aid the safety or safe working practices of lone employees?

Procedures to cope with safety issues

Participants #7, #9, #12 and #13 have asserted on the importance of the safety measures which need to be implemented in order to keep workers safe. These four participants share the common theme of employer simple mentoring and enforcing safe measures for home health care nurses. Almost all participants, emphasized on such measures that are critical to keeping them safe.

Safety Guidelines

- Respondent #4: I know the rear safety guidelines available for us to follow, which in forms you on how to access a home before you throw your self in a dangerous way per for my our duties with a third eye that constantly keep swatch of your surroundings... more needs to be done by management to ensure the well-being of their staff.
- Respondent #7: This is the core reason why I branched out in to my own establishment. I have safety rules and safety measures that are used to ensure my worker are not exposed to any form of unsafe work situations.
- Respondent #9: There is adequate safety measures taken to ensure we are safe when out in the field.
- Respondent #12: This job has opened my eyes to a lot of experiences in both unsafe and good moments. There are adequate measures to protect nurses who work at home and I have taken advantage of these safety measures.
- Respondent #13: Having protective and preventive measures keep the nurse safe from major risks on the job.

Intuition and Personal Evaluation

Participants #3 and #16 specifically revert to intuition and personal evaluation to cope with safety issues, in relation to perception of working alone. Participant #3 makes mention of safety measures but also indicates its insufficiency in the industry.

Respondent #3: There isn't enough safe working practices or ways to protect workers in the in this industry. It is more of an alone situation in these cases. You must use your intuition to decide if the environment is safe or not for you to perform for my our duties.

Respondent #16: Always evaluate your work environment before you commence on a job.

Management Interventions

The participants #4, #17, #15 and #7 did assert the importance of the management interventions to ensure the safety of the lone workers. Henceforth, a category of management interventions under the theme of coping procedures has merged. Various ways were expressed such as the technical devices needed or approaches such as background checks of clients, vetoing, and employee training to ensure the safety of the lone workers.

Respondent #4: I know there are safety guidelines available for us to adhere to, which inform s y o u on how to access a home before you throw yours el financial ways per for my our duties with a third eye that constantly keeps watch of your surroundings. Although, more needs to be done by management to ensure the well-being of their staff.

Respondent #17: A very challenging career, with lots of characters. You get to meet different individuals (patients), being aware that your protection is or has been covered by the employer, will you give more confidence to accept patients.

Question 3: Do you assess the risks each time you visit a client, patient or commence your task alone, and do you feel you informed of any risk before visiting a client while working alone?

Work Environment Assessment

The responses summarize the themes identified as work environment assessment by participants#1,#4,#5,and#16.

- Respondent #1: I always ensure I have a self– assessment of the environment before I commence any task
- Respondent #4: It is all a personal evaluation of the environment.
- Respondent #5: Risk assessment is a personal. You must think about your safety for every job you take on.
- Respondent #16: Always sevaluate your work environment before you commence on a job. A good job if you know the key ways to keep your self protected.

Pre– Job Information or details

Participants #1, #2, #3, #4, #5, #6, and #14 expressed the fact that their company do not provide any information about the working environment or the job they are taking. Henceforth, the participants must personally assess the working environment.

- Respondent #1: Not all the time but I always ensure I have a self–assessment of the environment before I commence any task. I am not informed of any risk before visiting clients.
- Respondent #2: Not always but I am very careful one very job.
- Respondent #3: No evaluation is done before I commence any task at a home, and I am not informed of risks
- Respondent #4: No,no evaluation is performed, it is all a personal evaluation of the environment.

Question4: Do you receive lone worker safety training and how effective is it?

Safety Training

In responding to question 4, 9 participants indicated they have either not received or had ineffective training in this field, resulting in a 53% outcome of “not received and ineffective safety training” out of the total number of participants (17), which is relatively high when looking at the number of participants.

Not received and Ineffective

The participants have expressed that they did not receive safety trainings from their organizations, or they have received few ones that they feel either not effective for all situations or insufficient.

Respondent #1: Occasionally we do have safety training. It does need to be performed quarterly though. This is my thought, because of the jobs we handle. Personally, it will be effective if it is done as much as I suggest.

Respondent #2: Not always. There are moments the safety training comes in handy and some where it is useless. These are the uncertainties we must deal with; the safety training doesn't cover a large area of possibilities and still puts us at risk.

Respondent #3: I haven't received safety training on this job, but I have had other safety training classes outside the job, and I use that knowledge to keep me safe.

Respondent #4: No, I do not get safety training frequently.

IV. EXPERIMENT

This chapter presents case studies on Lone working safety , risk assessment and management in APCO INFRATECH PVT. LTD , which are used to illustrate the developed Lone worker safety risk assessment and management

methodology, including an evaluation of important safety risks using the Task based risk assessment methods which have been incorporated into the model. The case study materials were collected from the particular in operation unit safety and projects site of the APCO INFRATECH PVT. LTD Site. The results of the safety risk assessment are safety risk scores for overall project, hazard groups, hazardous events, and types of safety risk with a confidence percentage. Many personnel are highly likely to undertake their everyday activities under lone working conditions, and have to ensure that all teams have a suitable and sufficient lone working risk assessment subsequently implementing adequate control measures to manage the risk. It will also ensure that local lone working protocol is implemented to ensure that staff whereabouts are regularly monitored, and there is a robust system in place to deal with emergencies. Procedure will also emphasis about serious incidents arise from lone working, and will ensure that they are reported as per incident reporting procedure and are investigated internally and addressed.

Objective

To establish safe lone working and personal safety for carrying out any maintenance / repair / inspection / construction work throughout Refinery and associated facilities as per approved plan.

Scope

This procedure is applicable inside refinery complex including COT & Jetty where lone working is involved in the area as per the approved factory plan.

This procedure applies to all staff members, including employees on permanent, fixed term, or casual contracts and other persons who provide support to customers on behalf of the organization, for example, contractors and agency workers.

This procedure outlines the general approach to lone working and personal safety both on-site and off-site.

This procedure demonstrates how staff will be expected to lone work, whether with customers or not, to ensure a safe working environment can be maintained.

Definitions

Lone Working

Lone working as a staff member carrying out normal work duties where no other staff are nearby. The risk will often relate to a customer, but could be from visitors to a building or from the nature of the work (e.g. Housekeeping at Nayara Hub during Weekend).

Lone working can be off-site or on-site and can take place either during the day or at night.

ISBL lone working

This relates to when person are away from routine work location. Following can be consider as Lone working at On-site area.

- High elevation jobs e.g. Column Top
- Fin Fan Area
- Confined space
- Sub-station and Satellite Building Jobs
- Material / chemical handling at MMC
- Working on weekends at Nayara Hub, MB, MMC, Batching Plant
- Working alone in dedicated Lab, e.g. engine lab and other.

Off-site lone working

This relates to when person are away from routine work location. Following can be consider as Lone working at Off-site area.

- PA system Testing
- F & G System Testing

- MCP Testing & Fire Extinguisher inspection at Off Site
- Flare Area jobs
- PIT & COT Tankages & Spheres Area
- Utilities Pump House, Desalter, Flare, Cooling Towers, Hazardous Waste Storage shed etc.
- COT Corridor Area
- Security personnel – QRT Patrolling Watch Towers and Refinery Entry & EBTSL CC Gates
- Conveyor belt inspection and maintenance
- Coal Handling system
- Rail / Road Gantry related jobs
- Horticulture work

Other lone working

Permit is not applicable to other lone working

- Transport pool vehicle – Pick up & drop at Airport / Railway station / accommodation
- External facilities audit / survey

Responsibilities

Permit Issuer

- Permit issuer is responsible for ensuring that all the activities in their area have a lone working risk assessment(s) and an effective lone working protocol in place.
- Permit issuer has to ensure lone working protocol are being followed and ensure that their team members engaged for lone working are well aware of their movements in line with the procedure.

Permit Receiver

- Permit receiver is responsible for the health, safety and welfare of all their team members engaged for lone working.
- Permit receiver has to ensure their team's personal health and safety, and comply with training, information and instruction given to prior to deployment for the job.
- Permit receiver should ensure each of their team is aware about risk assessment (TBRA) and including procedure.
- Lone working team should report any concerns relating to lone working to himself, and how to report any incidents including near misses.

Area Owner

- Area owner should ensure that all the services have carried out a lone working risk assessment and if necessary have an effective lone working protocol in place.
- Area owner has to ensure lone working risk assessment for lone working jobs carried out by their team. Where the risk assessment does not consider all risks, they must make this known to the area safety officer.
- They should also ensure that staff receive the relevant lone working and personal safety training, as well as any relevant training for their personal and service needs, before staff are permitted to work unsupervised.
- Area owner should approve and sign off relevant updates of individual risk management (TBRA) further to any incidents or changes in risk.
- Area owner should ensure that anyone working who is vendor / visitor, are aware about lone working protocol before attempting any lone working and adhere to it.

Reporting and Monitoring

- Any incidents that occur, while lone working or otherwise, must be recorded in portal and managed in line with incident reporting procedure.
- All lone working arrangements and protocols in services will be monitored during the various safety audits (SSO, CFSA and Contractor Safety Audit)

Risk Assessments and Protocols

Risk assessment

Risk assessment is an integral management tool that should be completed to ensure that employees are safe in their work. Every activity must use and adapt the appropriate organizational risk assessment through TBRA to determine the extent of risk attached to lone working for team members or people working on behalf for the Refinery (e.g. Vendors / Visitors).

Every service and head office team must use the appropriate organizational lone working risk assessment for the type of lone working undertaken. This may be Accommodation-based lone working, Office-site lone working or Lone Working in an office/hub.

Following should be consider by team

Which hazards are posed to staff working alone?

- Do staff work alone, when, how often, where, will they endure stressful situations without support?
- Are there any other hazards posed from activities they undertake whilst lone working such as manual handling or work at off site area?
- What is in place to manage this risk? This may include duty call in/call out systems, customer risk management plans, communication systems/phone apps/radio's, training, CCTV and other security measures, door locks.
- What further actions are needed in order to reduce risk, who is responsible for these and when these will be put in place?

TBRA team should know how to do a dynamic doorstep risk assessment.

Personal alarms or calling systems, getting the emergency services (use of MCP /PA system / Field phone) involved in risk management plan and making them aware of your regular activity, where the risk is too high consider eliminating lone working.

To determine level of risk involved in the lone working, Level of risk should be categories

Category 1: Low Risk situation

- Staff working outside normal hours in an office, Nayara Hub, Maintenance Building, MMC etc.
- Staff who travel alone for External facilities audit / survey
- Transport pool vehicle pick & drop

Category 1: Medium Risk situation

- Use of meeting rooms at Nayara hub
- Onsite lone working activities

Category 1: Medium Risk situation

- Working out of hours (not in controlled premises)
- Working alone with hazardous plant , tools, equipment or chemical

Based on the risk assessment, lone working protocol can be changed and accordingly followed.

Local Protocol

Permit receiver should use the risk assessment and risk review to develop the local protocol. They are also responsible for ensuring that all relevant team members and visitors are aware of the protocol and that its requirements are understood and met.

The local protocol must also establish a monitoring system for the service to ensure that the whereabouts of all team members are always known, which may include the role of a duty desk and a formal calling in process.

For services where staff lone work out of hours, the protocol should include arrangements to ensure their safety. Local protocol system will include the following

- What a lone worker should do if they feel threatened, The procedure for raising an alarm appropriately
- The procedure to follow when a lone worker raises the alarm
- If there are any different arrangements required out of hours and what these are?
- The process for confirming lone working has concluded safely
- Search operation sop to be prepared by respective Dept. for any person missing or abnormal situation during the job.
- Annexure 1 checklist for lone working
- Annexure 2 Format for lone working local register

Training and Information

Every activity must use and adapt the appropriate organizational risk assessment through TBRA to determine the extent of risk attached to lone working for team members or people working on behalf for the Refinery (e.g. Vendors / Visitors).

Training to ensure competency is particularly important where supervision is limited. Training may also be critical to avoid panic reactions in unusual situations.

Lone workers need to be sufficiently experienced to understand the risks and precautions fully. Managers and supervisors need to set limits on what can and cannot be done when working alone. Employees must be competent to deal with circumstances that should arise.

Personal safety training will be provided to staff lone working and cover:

- The procedure to follow when a lone worker raises the alarm
- Advice and guidance not to go into a situation if you feel at risk.
- Use of conflict resolution or defusing techniques. These include being aware of non-verbal communication; how to behave in a non-confrontational way; the importance of good customer care; being polite; and listening to clients.
- To be aware of surroundings .and your own actions and how others may perceive you.
- Dynamic risk assessments, if you feel threatened, make your excuses and leave. Make sure you can leave the premises quickly if you need.

V. DISCUSSION

Unpredictable working environments, overinvestment in care beyond roles, and delegation of duties have led to differences in the tasks performed by HHCWs and their associated risks. Lone working during high- risk job duties presents an unacceptable risk level to workers. Employers and professionals shouldn't wait for full regulatory action by OSHA to protect affected employers. Rather, assessment of hazards involving lone working and reduce the related risk by implementing risk controls and working alone safety programs planned by the employers.

HHCWs organizations can support staff safety by developing policies and providing training for staff entering patient homes to assess, recognize and prevent violence in patient homes (Markkanen et al., 2014; Hanson et al., 2015). Strategies may include the use of risk-assessment tools (Brennan2010), conflict resolution and de-escalation training and supporting staff decisions to refuse to enter patient homes deemed to be a threat to their personal safety (Fitzwater & Gates, 2000; Sylvester & Reisener 2002; Gershon et al., 2008a; Henriksen et al., 2008; Galligan et al., 2015).

In the survey questions, the participants who worked in the city/suburbs showed from their experiences with working in the city has exposed them to fewer confrontations or unsafe situations, although they are still exposed to job-related violence. The second research question revealed ways Industries organizations and employees can mitigate and identify the risks to lone workers in the field from the participants' responses.

Assessing the risk can help Identify the possible dangers of a job, suggest safe work practices and elimination of risk and hazards. Most participants in this study, signified the absence of risk assessment done by the employer. It all comes down to the employee, making use of self-learned skills to assess the work environment.

Home visits are another potentially dangerous situation for practice nurses, particularly when they are visiting high-risk areas or locations, and it is here that modern technology in the form of personal safety alarms should be made available. Many of these devices now incorporate global satellite positioning to track exactly where individuals are and to get help to them as quickly as possible if necessary. Other mobile phone-based systems can incorporate an alert 'call back' function, which automatically rings pre-arranged locations at regular intervals should the individual not report back to base following a home visit or other lone working duty. The threats posed to the safety of all lone workers should not be ignored, particularly now that effective safety devices are readily available.

VI. CONCLUSION

This study concludes that the first step in improving lone worker safety compliance must start with ensuring that lone worker comply with safety procedures, Especially when production demand is high.

A key factor in improving safety compliance was providing employees with hands-on manager support that meets their needs on a regular basis. Results suggest that just the physical presence of a manager may not aid in lone workers feeling supported. To ensure compliance when production demand is high then application of the results from research question2 can enable managers to better improve the overall safety climate (Jiangetal.,2015).

Starting with external factors like technology and training can be relatively simple and quick improvements for management to start with. These improvements included: are liable communication system, reduced distractions from company provided technology, and in-person training for lone workers. Next, management should use hands-on, in-field, training for lone-workers in risky situations that non-compliance feels justified. These risky and justified situations vehicle related, to environmental risk, and PPE non-compliance. To aid in improving those procedures and training for situations. This allows managers to check that each situation's procedure is relevant, trains the lone worker on "why" compliance is important in that situation, and can further investigate the improvement of the procedure's safety-productivity compatibility. Finally, working externally to perceived and personal factors then results in leadership's demonstration of prioritizing safety first to their lone workers which may improve the personal and perceived influencers.

When establishing safe working arrangements for lone workers, employers need to know the law and standards that may apply to their specific work activity. They must then assess if the requirements of that work activity can be met by people working alone.

Lone workers should not be at more risk than other employees. This may require extra risk control measures. Precautions should take account of normal work and foreseeable emergencies, e.g. fire, equipment failure, illness and accidents. Employers should identify situations where people work alone and ask questions such as:

Does the workplace present a special risk to the lone worker?

Is there a safe way in and a way out for one person?

Can any temporary access equipment that is necessary, such as portable ladders or trestles, be safely handled by one person?

Can all the plant, substances and goods involved in the work be safely handled by one person?

Consider whether the work involves lifting objects too large for one person or whether more than one person is needed to operate essential controls for the safe running of equipment.

Is there a risk of violence?

Are women especially at risk if they work alone?

Are young workers especially at risk if they work alone?

Check that lone workers have no medical conditions which may make them unsuitable for working alone. Seek medical advice if necessary. Consider both routine work and foreseeable emergencies, which may impose additional physical and mental burdens on the individual.

Training is particularly important where there is limited supervision to control, guide and help in situations of uncertainty. Training may be critical to avoid panic reactions in unusual situations. Lone workers need to be sufficiently experienced and to understand the risks and precautions fully. Employers should set the limits to what can and cannot be done while working alone. They should ensure employees are competent to deal with circumstances that are new, unusual or beyond the scope of training, e.g. when to stop work and seek advice from a supervisor and how to handle aggression.

Although lone workers cannot be subject to constant supervision, it is still an employer's duty to ensure their safety and health at work. Supervision can help to ensure that employees understand the risks associated with their work and that the necessary safety precautions are carried out. Supervisors can also provide guidance in situations of uncertainty. Supervision of safety and health can often be carried out when checking the progress and quality of the work; it may take the form of periodic site visits combined with discussions in which health and safety issues are raised.

The extent of supervision required depends on the risks involved and the ability of the lone worker to identify and handle safety and health issues. Employees new to a job, undergoing training, doing a job which presents special risks, or dealing with new situations may need to be accompanied at first. The level of supervision required is a management decision, which should be based on the findings of risk assessment, i.e. the higher the risk, the greater the level of supervision required. It should not be left to individuals to decide whether they require assistance.

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