Original Article

Occupational Exposures in the Homecare Environment: Piloting an Observation Tool

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Abstract

The population of home healthcare workers (HHCWs) is rapidly expanding. Worker tasks and the unique home care environments place the worker at increased risks of occupational exposures, injury, and illness. Previous studies focusing on occupational exposures of HHCWs are limited to self-reports and would benefit from direct observations. The purpose of this study is to describe the occupational hazards observed in the unique work environment of home healthcare. HHCWs and home care patient participants were recruited from one home care agency in the Midwest to be observed during a routine home visit. This cross-sectional study used a trained occupational health nurse for direct observation of the occupational setting. Standardized observations and data collection were completed using the Home Healthcare Worker Observation Tool. The observer followed a registered nurse and occupational therapist into 9 patient homes observing visits ranging from 22 to 58 minutes. Hazards observed outside of and within the home include uneven pavements (n = 6, 67%), stairs without railings (n = 2, 22%), throw rugs (n = 7, 78%), unrestrained animals (n = 2, 22%), dust (n = 5, 56%), and mold (n = 2, 22%). Hand hygiene was observed prior to patient care 2 times (22%) and after patient care during 5 visits (56%). Observations have identified hazards that have the potential to impact workers' and patients' health. The direct observations of HHCWs provided opportunities for occupational safety professionals to understand the occupational exposures and challenges HHCWs encounter in the home care environment and begin to identify ways to mitigate occupational hazards.

Keywords

home healthcare, hand hygiene, occupational hazards, ergonomics, home care workers

Background

A worker's health is impacted by the environment in which they work and the tasks they complete; workers who provide healthcare in the home environment are no exception. The U.S. Bureau of Labor Statistics (BLS) reported the home health care service industry employed 1,527,400 workers in 2019 and is projected to increase by 29.9% to 1,983,400 by 2029.[1] The dramatic growth is attributed to the growing population of persons over 65, more patients seeking care for chronic health conditions, and improvements in technology and medical advancements allowing more complex patient care to be provided at home.[2] Dependent on the state the worker is employed in, the home care aide or patient care aide, may provide some assistance with medication and check vital signs.[3] Licensed and professional healthcare workers who provide services within the home include nurses, advanced practices nurses, physicians, respiratory therapists, occupational therapists, speech pathologists, physical therapists, and social workers. Unlicensed workers within the industry include patient care aides who assist patients with daily activities such as bathing, feeding, housekeeping. Both licensed and unlicensed groups of workers have similar occupational exposures when entering the uncontrolled home care environment; however, some differences have been noted based on the different tasks they complete.[4] For this study, all workers that enter the home and are employed by a home care agency are considered under the term HHCWs.

In previous research, HHCWs, managers, and union representatives have reported similar exposures as other healthcare environments such as bloodborne pathogen exposures,

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ergonomic concerns, violence, chemical, and exposure to slip, trip, and fall hazards.[4-8] Hazards unique to the community and home include violence from pets, moving furniture to gain access to patients, lack of proper sharps disposal, lack of sharps engineer safety devices, lack of ventilation, indoor air quality concerns related to pets and pests, and environmental smoke exposure.[4-7,9-11] Researchers discussed the importance of specific training needed to address the hazards and the environment of the home that HHCWs encounter, moving towards training that is specific to the occupational environment of the home.[4,11]

Limitations of previous studies include potential for recall bias and information bias as hazard reports are based on the perception of the worker and hazards they encounter.[4] In previous studies, HHCWs are asked to report their frequency of exposure as they remember it within the past week or past year, potentiating recall bias.[4,9,10,12] The Centers for Disease Control and Prevention (CDC) indicates there is a benefit to having workers report site hazards, but these reports do not take the place of formal worksite environmental assessment.[13] It is this emphasis that underscored the importance of occupational environmental assessments when planning this research in the occupational setting of the home care environment to identify any hazards that carry potential health effects for workers in this rapidly growing industry.

Health Impacts

The known health impacts of occupational exposures for HHCWs is limited; however, there is enough evidence to know the job is not free from hazards nor workers free of poor health outcomes. Occupational hazards that have been documented as potential respiratory irritants include chemicals, dust, pests, pets, and tobacco smoke. The population of HHCWs have a higher prevalence rate of asthma at 13.2%, compared to the prevalence rate of 7.2% for all U.S. workers combined.[14] HHCWs report a higher prevalence of smoking at 25.8% compared to all U.S. workers combined at 19.7%.[14] From these statistics, it is hard to determine what exposures are causing an increase in HHCWs' asthma prevalence rate. In addition to being a respiratory irritant, tobacco smoke has other health impacts to consider for HHCWs. According to the CDC, second hand smoke (SHS) comes from the smoke of burning tobacco products and the smoke exhaled from the person smoking.[15] It contains more than 7000 chemicals, of which approximately 70 are known carcinogens.[15] The health consequences associated with SHS exposure have been clearly documented. Nonsmoking adults exposed to SHS have increased cardiovascular and heart disease risk accounting for 34,000 deaths each year from 2005 to 2009 and 7300 deaths from lung cancer in the same timeframe.[15] As SHS settles on surfaces and dust within an environment, a chemical reaction occurs creating other toxins, described by researchers as third hand smoke (THS).[16] No statistics were found related to occupational exposure and THS; however, as it has been identified as an environmental toxin related to tobacco smoke, it will be considered a potential source of occupational tobacco smoke exposure (TSE). Identifying the type and frequency of TSE HHCWs encounter is important and was included in the observation study.

NIOSH reports that musculoskeletal injuries were reported as the most frequent injury in HHCWs with a rate of 20.5 per 10,000 workers and HHCWs take more sick leave for musculoskeletal injuries than other occupations.[17] The unique environment of each home, the lack of patient assist devices, awkward positions, and employees working alone, all precipitate musculoskeletal injuries with this group of workers.[17] Identifying the tasks workers complete and frequency of multiple ergonomic positions that increase a workers' risk of musculoskeletal injury has been included within the observation tool.

In addition to respiratory and musculoskeletal injury and illness, blood borne pathogen exposures have an impact on HHCWs. In 1 study, the incidence rate of home health and hospice workers who experience needle stick or bloodborne pathogen exposure to non-intact skin was 27.4 exposures per 100,000 home visits.[18] Needlestick injuries and blood borne pathogens exposures carry a risk of potential health outcomes that include but are not limited to HIV, Hepatitis C, and Hepatitis B.[19] In addition to reported needlestick exposures, previous studies found that home healthcare registered nurses underreported needlesticks at a rate of 35% to 50% and the underreporting may be due to a fear of job loss, lack of reporting systems in place, and lack of time to report due to job constraints.[20,21] In addition to underreporting, HHCWs are at increased risks to encounter sharps and bloodborne pathogen exposure due to lack of sharps engineering devices, improvised sharps containers, lack of training on sharps available in each home, and reuse of sharps.[22] Items related to type of sharp used, type of sharps container, and frequency of sharps encountered during the home care visit are included in the observation tool.

Problem and Purpose

The number of HHCWs is growing at a rapid pace as more people are seeking care to be provided in their home. Previous studies have relied on survey data of anecdotal self-reports of occupational hazards of HHCWs and come with some concerns of bias. To this date, a study has not been identified in which trained occupational health and safety professionals were used to assess the occupational environment of the HHCW through direct observation. Standardized observations by researchers trained in the recognition of occupational hazards will potentially limit the bias of previously self-reported data, providing opportunities for occupational safety professionals to begin to identify ways to mitigate occupational hazards within the home care environment. The purpose of this study is to pilot the use of the observation tool and describe the occupational hazards observed in the unique work environment of home healthcare.

Table 1. Visit Length and Purpose of Visit by HHCW Type.

Type of worker	Visit length, mean minutes (range)	Purpose of visits
Occupational therapist	51.5 (45-58)	The OT completed a follow up visit and initial patient visit. Visits consisted of evaluation of activities of daily living and assessing education needs to train the patient based on current limitations while remaining in their home during the rehabilitation period.
Registered nurse	31.6 (22-43)	The RN completed visits to patients for whom care was already established. Visits included assessment of chronic illness; wound care; assessment of new symptoms including vital signs assessment and communication with family and physician; assessment of chronic conditions and education of symptoms, medication use, and dietary needs with patient and family.

Methods

Study Design

A cross-sectional design was used to observe HHCWs during a home care visit in the patient home care environment. The observations and data collection were completed using the Home Healthcare Worker Observation Tool. The University of Cincinnati Institutional Review Board approved the study. Written and informed consent were obtained from HHCW participants and home healthcare patients.

Setting

One home healthcare agency, of 26 contacted agencies contacted in Ohio and Kentucky agreed to participate in the study, allowing recruitment of participants from their HHCWs and patients. The setting for the study was the homes of patients receiving home healthcare services. Recruitment strategies included presenting the project at staff meetings, distribution of recruitment materials at the meeting, and follow up emails with reminders of the ongoing study.

Sample

All workers who were employed by the agency and provided care in the home of healthcare patients were invited to participate in the study, regardless of title and profession. HHCWs included were 18 years or older. Home care patients invited to participate in the study were currently being provided home care services from the partnering agency. The home care patients and workers agreed to allow the researcher to observe a routine home care visit. The HHCW participants included 1 occupational therapist (OT) and 1 registered nurse (RN). Further demographics of these HHCWs are not presented in order to protect their identities within the small agency.

The OT has worked in home care for twenty years. The occupational therapist provided opportunities to observe 2 home care visits and both patients volunteered to participate. The RN has worked in home care for 8 years. The RN provided opportunities to observe 7 home care visits and all patients volunteered to participate. For an overview of the purpose of the visits see Table 1.

All home care patients within this sample were adults, with BMI mean of 27.9 (range 15.1-41.6). Height and weight were not provided for 1 home care client. No other demographics for clients were collected as other demographics were not applicable to this study.

Procedures

HHCWs interested in participating in the study contacted the principal investigator (PI) via phone call, text, or email to clarify any questions, indicate their desire to participate, and schedule a date and location for observation. Upon meeting at the first home care location, the HHCWs signed a consent and completed a demographic information sheet. At each home, the home care client was provided details about the study, invited to join the study, provided an opportunity to ask questions or refuse to participate, and signed a written consent. Once consents were completed, observations began with care taken for observers not to interact with the participants during the visit, only observing and documenting on the observation tool specifically designed for the study. Observations lasted as long as the home care visit.

Instrumentation

The observation tool used in this study consists of 636 items with occupational hazards of interest in the following categories: slip/trip/fall; sharps and bloodborne pathogens; environmental hazards; violence; ergonomic hazards; medications and procedures; and chemical use. The tool development followed 3 steps: determining content domain, content validity, and inter-rater agreement. Content domain was developed based on a literature review of the hazards home healthcare workers have reported and through consultation with occupational health and safety experts who are familiar with the home care environment. The findings from the literature review were previously published.[23] The scale level content validity index (S-CVI) was 0.90. Inter-rater agreement tests demonstrated a percent agreement and accuracy mean of 89.5% and frequency variables resulted in standard deviations from 0 to 8.62. It was determined the observation tool encompasses the diverse range of occupational hazards

HHCWs encounter; inter-rater percent agreement and overall accuracy scores were acceptable; and this tool can be used to assess HHCW occupational hazards.

The observer used the tool to document the hazards they observed in the home during the home care visit. Certain areas of the tool, such as chemical use, may not have been used if the worker did not complete any cleaning during the visit. Demographic data were collected from the worker.

Data Analysis

Due to the small sample size, statistics were limited to descriptive statistics. The mean and range for length of time for home care visits was calculated. The characteristics of the home and neighborhood were depicted using frequencies and percentages. These data points were evaluated separately to assess hazard exposure for the OT and RN and combined to evaluate the hazard exposure in the combined HHCW group. Frequencies of ergonomic stress by posture were assessed using mean and range.

Results

Summary of Visits

The length of time for home care visits ranged from 22 to 58 minutes. The OT's tasks included evaluation and teaching related to patients' limitations and activities of daily living to safely continue to live independently within their home. The RN's tasks included wound care, assessment of chronic and acute symptoms including communication with patient, family, and physician related to symptoms and patients' current health state. A summary of the visits is described for each professional group in Table 1.

Home and Neighborhood Characteristics

The combined results of the observations of HHCWs included entering single-family (44%) and multi-family homes (56%) (see Table 2). These homes were located within suburban (44%) and rural (56%) neighborhoods. Parking areas included driveways (33%), parking lots (33%), and streets (33%). There were no loitering or signs of crime during the observations. Descriptive characteristics of homes visited by each worker and combined are shown in Table 2.

Table 2. Descriptive Characteristics of Homes Visited by Worker Type.

	% (*N*)		
Variable	OT	RN	Combined
Type of neighborhood			
Urban	0 (0)	0 (0)	0 (0)
Suburban	100 (2)	29 (2)	44 (4)
Rural	0 (0)	71 (5)	56 (5)
Type of home			
Single-family	50 (1)	43 (3)	44 (4)
Multi-family	50 (1)	57 (4)	56 (5)
Place to park			
Driveway	50 (1)	29 (2)	33 (3)
Parking lot	50 (1)	29 (2)	33 (3)
Street	0 (0)	42 (3)	33 (3)

Note. 0 indicates these items were not encountered during observations.

Slip, Trip, and Fall Hazards

Outside the home. Slip, trip, and fall hazards can be encountered when walking to or from the patients' home and within a patients' homes (see Table 3). Uneven pavement when walking to the patients' home was encountered during 6 (67%) of the observations and included precipitation in the form of rain in 3 (33%) of the visits. The exterior of 2 homes (22%) included stairs without railings. Upon approach to 1 home (11%), an unattended and unrestrained animal was observed outside.

Within the home. Slip, trip, and fall hazards are encountered within the home. Throw rugs were the most observed slip, trip, and fall hazard noted within the home (n = 7, 78%). An uneven walkway was noted within 2 homes (22%). A cluttered walkway was noted in 4 homes (44%). Animals were observed within 2 homes (22%) and include 1 dog and 1 cat. These animals were unrestrained, however not aggressive during the observation. Stairs without a railing were observed in 1 home (11%). Inadequate lighting was noted in 3 homes (33%). An electrical cord was noted on the floor in 1 home (11%) within the walking area of the HHCW.

Environmental Hazards Within the Home

Environmental hazards were observed within 6 homes (67%) of the 9 homes entered. Dust was the most commonly noted hazard and observed in 5 (56%) homes. Mold was observed in 2 homes (22%). Some home owners have pets and are considered a potential allergen and infectious hazard for HHCWs. A cat was present in 1 home (11%) and a dog (11%) was observed in another home. Tobacco smoke smell was present in 1 home (11%).

Hand Hygiene

Hand hygiene is a basic principle to prevent the transmission of germs amongst healthcare workers and patients and includes the use of hand sanitizer or soap and water. During the 9 observations, workers were observed performing hand hygiene before patient care 2 times (22%). Hand hygiene was observed after patient care during 5 visits (56%). Two of these occurrences were post wound care and application of medication and after gloves were removed.

Table 3. Observed Exposure Hazard by Category per Home Visit.

	OT 2 home visits, % (*n*)	RN 7 home visits, % (*n*)	Combined 9 home visits, % (*n*)
Slip/trip/fall outside of home			
Uneven pavement	0 (0)	67 (6)	67 (6)
Cluttered walkway	0 (0)	0 (0)	0 (0)
Precipitation	0 (0)	43 (3)	33 (3)
Animals	0 (0)	14 (1)	11 (1)
Stairs without railing	50 (1)	14 (1)	22 (2)
Inadequate lighting	0 (0)	0 (0)	0 (0)
Slip/trip/fall inside of home			
Uneven walkways	0 (0)	29 (2)	22 (2)
Cluttered walkway	50 (1)	33 (3)	44 (4)
Animals	50 (1)	14 (1)	22 (2)
Stairs without railing	0 (0)	14 (1)	11 (1)
Lighting inadequate	50 (1)	29 (2)	33 (3)
Narrow walkways	0 (0)	0 (0)	0 (0)
Electrical cord	0 (0)	14 (1)	11 (1)
Throw rugs	50 (1)	86 (6)	78 (7)
Water/grease on the floor	0 (0)	0 (0)	0 (0)
Environmental exposure in the home			
Mold	0 (0)	29 (2)	22 (2)
Dust	100 (2)	33 (3)	56 (5)
Dog	0 (0)	14 (1)	11 (1)
Cat	50 (1)	0 (0)	11 (1)
Tobacco smell	0 (0)	14 (1)	11 (1)
Active smoking	0 (0)	0 (0)	0 (0)
Hand hygiene			
Before patient care			
Sanitizer	100 (2)	0 (0)	22 (2)
Soap and water	0 (0)	0 (0)	0 (0)
Dried with disposable towel	0 (0)	0 (0)	0 (0)
After patient care			
Sanitizer	100 (2)	14 (1)	33 (3)
Soap and water	0 (0)	29 (2)	22 (2)
Dried with disposable towel	0 (0)	14 (1)	11 (1)
Dried with reusable towel	0 (0)	14 (1)	11 (1)
Safety factors			
Patient confusion	0 (0)	14 (1)	11 (1)
Firearm in home	0 (0)	14 (1)	11 (1)
Unrestrained pet in home	50 (1)	14 (1)	22 (2)
Object around neck	100 (2)	71 (5)	78 (7)
Communication device- cell phone	100 (2)	100 (7)	100 (9)

Ergonomics

The observation tool has several sections to capture HHCWs exposure to potential ergonomic hazards including lifting of equipment and positions that cause stress on the body. Each HHCW carried a bag into and out of each home. The weight of the OT's bag was 10.2 pounds and the RN's bag was 10.8 pounds. Each bag was lifted out of and back into the vehicle then rolled into the home. Several home entrances required the worker to carry the bag up the stairs to enter the home; however, this frequency was not captured within the observation tool. The bag, which is on wheels, sits on the floor and contains the items the HHCWs uses throughout their visit including: laboratory supplies, assessment supplies, a computer or tablet for documentation, information brochures for new clients, stethoscope, hand sanitizer, and gloves. During patient care and assessments, bending was the most frequently observed position with the OT bending an average of ten times per visit, and the nurse bending an average of 9 times per visit. The OT was observed during 1 visit to bend and reach during assistance of the patient from the toilet. The RN was observed pushing or pulling medical equipment 4 times during their 7 visits.

Sharps and Chemical Use

During the 9 visits, no sharps were used nor encountered by the OT or RN. One patient did demonstrate the use of her glucometer and placed the lancet in an approved sharps container; however, the worker did not need to assist with the sharp use in any way. The observations did not include any cleaning activities or chemical use.

Personal Safety and Violence

During 7 visits (78%), the HHCW was observed to have an object around the neck. These items included a lanyard with a nametag and a stethoscope. Additional observations for potential violence or harm during the visits were 1 patient with confusion and 1 firearm. These were not within the same home. Pets can be another source of aggression within the home care setting and 2 unrestrained pets were observed during the visits (22%). There were no threats of violence nor aggression during the visits, and the HHCW had access to a cell phone if communication was necessary. Table 3 represents the observed exposure hazard by category per home visit.

Discussion

The purpose of this study was achieved by piloting the observation tool and describing the occupational hazards HHCWs experience. The 9 homecare visits observed provide insight into the occupational exposures and challenges HHCWs encounter in patients' homes. Observations of the OT and RN during typical home care visits offered additional insight that HHCWs encounter similar hazards associated within a home and different hazards based on the type of care provided. In addition, analysis has identified hazards that have the potential to impact workers' and patients' health.

Slip, trip, and fall hazards have been noted in other studies both within and outside patients' homes.[4,8] Within this study, throw rugs were the most frequent slip, trip, and fall hazards noted. Throw rugs may affect the patient and any worker that enters the home. There are many recommendations for elderly to remove throw rugs to prevent falls. It was surprising that 78% of the homes had throw rugs, even though there are recommendations for throw rugs to be removed as persons begin to age.[24,25] The amount of clutter within walkways was minimal; however, it would be safer for the worker and patient if there were no clutter adding trip and fall risks. Although 33% of the homes had inadequate lighting in the area where the HHCW was working, none of the HHCWs asked to turn a light on within the space. Pets can be a fall hazard if they get under the worker's feet and a violent injury risk if they become aggressive, yet the HHCWs did not ask the pets to be placed in another room during the visit. In previous studies, HHCWs were able to identify hazards such as throw rugs that had not been removed; unrestrained pets; clutter in work area; and tobacco smoke exposure; however, they made decisions that are ineffective at removing the hazard 63% to 72% of the time, thereby continuing to work in a hazardous environment.[26] Developing brochures, talking points, and policies addressing these risks for HHCWs and patients could provide HHCWs with the support needed for changes to be made in the home care environment. A HHCW fall can impact the worker, continuity and quality of care for the patient, and a significant cost to the employer for medical expenses related to worker compensation. Howard and Adams found that falls from the same level that included days away from work cost an average of $30,344 per claim. Falls from the same level without days away from work cost an average of $1985 per claim.[27]

Respiratory exposures have the potential to impact healthcare workers both acutely and chronically. The observations did not include any exposure to respiratory irritants with cleaning chemicals; however, mold, dust, environmental tobacco smoke, pets, and pet dander were within the environment of the home. These observations align with previous studies in which HHCWs report occupational exposures to these same respiratory exposures.[4-7,9-11] According to NIOSH, HHCWs have an asthma prevalence rate higher than all industries combined.[14] It is important to identify the risks these common household allergens have on workers who are entering the home care environment. In other areas of healthcare, such as acute care, ambulatory care, and long-term care, these respiratory irritants are not present. Previous studies and the observation study are not designed to measure the amount of exposure within the air or a level of risk for specific health outcomes. Future studies could be designed to capture the actual level of respiratory exposures through indoor air quality assessments.

Hand hygiene is the simplest way to prevent the spread of disease in healthcare, and home healthcare is no exception.[28] Previous studies of hand hygiene in home care are limited; however, 97% of HHCW participants responded they are compliant with handwashing using soap and water and 83% compliant with use of hand sanitizer.[6] For all visits combined, hand hygiene was completed during 2 visits (22%) prior to contact with the patient and 5 times (56%) after contact with the patient. A HHCW was observed twice washing their hands with soap and water after removing gloves; however, hand hygiene was not performed prior to donning gloves as indicated by the CDC for healthcare workers.[28] The observations where completed in March 2020, the end of 2019 flu season and just before the COVID-19 pandemic was announced. Despite being a time of high awareness related to infectious disease, HHCW vigilance with hand hygiene was not observed. One detail not captured by the observation tool relates to the guidance to complete hand hygiene after contact with items in the patients' environment. This detail would be captured after the HHCW left the patients' home as the last opportunity to be in contact with patient items such as the door handle upon

leaving. Unclean hands have the potential to transmit pathogens to the worker, workers' vehicle, workers' care bag, and to subsequent home care clients. The small sample size and missed opportunities for hand hygiene leave questions as to the breadth of this concern within the home healthcare industry. Standards, guidance, and education are very clear as to when hand hygiene is indicated for healthcare workers.

Ergonomics

Work tasks that are ergonomically fit to workers decrease the risks of musculoskeletal injuries.[29] HHCWs enter a unique, unplanned environment with every home they enter, increasing the risks of injury. Waters et al.[30] indicates ergonomic stress in home care is related to awkward postures and forceful lifting that can occur during manual lifting and moving of patients, housekeeping, and moving furniture.[30] During the 9 observations, only 1 HHCW was observed assisting a client from the toilet. There were no grab bars or other assist device used. Several other tasks were noted during the observations that have the potential to increase workers risks of musculoskeletal injuries due to ergonomic stressors. Each HHCW was observed lifting a 10-pound bag into and out of their vehicle for each patient visit. Once in the home, the bag became another ergonomic stressor. For each item the worker needs to obtain from the bag or put back into the bag, the worker is observed bending at 120° or more. The deep degree of bend places increased stress on the back. Further observations to capture the frequency of this movement is important. Hittle et al.[4] estimated that home care nurses lift or carry medical equipment 1118 times a year. It is unclear if the bag they carry into and out of each home is included in this estimate, but further inquiry into ergonomic stressors should include the transport and access of the HHCWs clinical care bag. Howard and Adams[27] analyzed workers compensations claims of HHCWs and found that back/spine was the most common injury, including non-traumatic soft tissue musculoskeletal injuries and falls. Non-traumatic soft tissue injuries of the upper extremities average $29,854 per claim with days away from work and $1340 per claim without days away from work.

Violence

Mental health disorders have been noted to increase risk for violence among healthcare workers.[31] Within the observations, 1 patient was noted to be confused as indicated by the spouse, who was present. Type II violence is described as violence from the patient to the worker[32] and several items within the observation tool are available to document such violence if it occurs and capture risk factors such as confusion or intoxication. During the visit, the patient did not display any forms of aggression, and confusion was the only risk factor noted.

Limitations

The sample was limited to a convenience sample obtained from 1 partnering home care agency. Obtaining partner agencies was difficult and proved to be a significant barrier to beginning data collection. The team who reached out to potential partner agencies had few call backs to participate after the initial call from the researcher indicating the purpose of the study was to observe the HHCW in the home environment, capturing data about occupational exposures HHCWs encounter. Due to the small sample size, full psychometric analysis was not able to be assessed and will be prioritized in future studies.

The small sample size of participants, workers and clients, were recruited from 1 home care agency in Ohio and therefore, the generalizability of the results is limited. The number of observations for this study was limited by the COVID-19 pandemic in the spring of 2020 due to a statewide stay-at-home ordered and halt for non-essential research activities by the university's vice president for research. This limitation impacted the statistical data analysis that could be completed due to small sample size. Some types of observations are likely less variable than they might have been had they not been conducted by 2 workers. For example, 7 hand hygiene observations are nested within a single worker and compliance may be due to an aversion to the use of hand gel.

This study limited quantification of exposures to observed or not observed; whereby, not providing a level of hazard exposure or risk assessment based on the observed exposure. Similarly, previous studies indicate the need to quantify occupational risks HHCWs encounter with a goal of reducing harm.[4,7]

Implications for Occupational Health Practice

The industry of home healthcare, worker outcomes, and patient outcomes would benefit from involving occupational health professionals, including occupational health nurses, to conduct workplace assessments of the home care environment. In consideration of the increased asthma prevalence within this worker population, future inquiries evaluating respiratory risks would be beneficial. Further studies, specifically air sampling measures, would provide researchers the ability to quantify respiratory hazard exposure levels within the occupational environment. Statistical modeling to determine causal inferences of health risks within this worker population could be leveraged to focus future work on mitigation of hazards causing poor worker health outcomes.

Conclusion

HHCWs encounter a range of occupational exposures within each home they enter. This study and further observations within the home will allow research to expand beyond

self-report surveys. Observations of HHCWs in the home setting must be continued after the COVID-19 pandemic resolves to gain a holistic account of the occupational hazards HHCWs confront within the patient home. Future studies are necessary to identify the barriers for hand hygiene compliance in home care, as hand hygiene has the opportunity to improve patient and worker outcomes. These observations provided insight that could not be obtained by the occupational health researcher through the lenses of the worker within a survey. The researcher's observations identified workplace tasks that increase infectious risks to the patient and the worker and repetitive ergonomic risks to the worker.

Applying Research to Occupational Health Practice: Results of observations in the home healthcare workplace environment provide insights of hazards that may impact home healthcare worker and patient outcomes. Hazards observed include dust, mold, tobacco smoke exposure, slip/trip/fall hazards such as unrestrained pets, throw rugs, and uneven pavement. Ergonomic exposures were related to the organization of worker supplies and tasks workers complete. Hand hygiene practices were also captured within the observations and are of interest to worker and patient outcomes. This study provided initial insight as to how findings of observations in the occupational environment of HHCWs may provide more knowledge of the potential impact of occupational hazards on the outcomes of home care workers and patients.

Author Contributions

EB conception and design of the study, data collection, analysis and interpretation of the data, drafting of the article, revising and critical input for intellectual content, accountable for integrity of the written work. KD conception and design of the study, revising and critical input for intellectual content, accountable for integrity of the written work. SR analysis and interpretation of the data, revising and critical input for intellectual content, accountable for integrity of the written work. GG conception and design of the study, assistance with drafting of the article, revising and critical input for intellectual content, accountable for integrity of the written work.

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Supplemental material

Supplemental material for this article is available online.

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