Safety in the Home Healthcare Sector: A Pilot Study

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Robyn R. M. Gershon, MT, MHS, DrPH
Principal Investigator
Telephone: 212-305-1186
Email: rg405@columbia.edu

Mailman School of Public Health
Columbia University
722 West 168th Street
New York, NY 10032

Federal Project Officer: Judith Sangl, PhD; 301-427-1308 (judy.sangl@ahrq.hhs.gov)

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ABSTRACT

Purpose: The purpose of this 1-year pilot study was to develop and test a novel household safety survey tool for use in the home healthcare (HHC) setting.

Scope: A simple-to-use household safety survey tool can provide the basis for hazard identification and this information can serve to guide the development of targeted risk reduction interventions. Although unsafe conditions in the home care setting have the potential to adversely affect the delivery and quality of patient care, data on this issue are exceptionally sparse.

Methods: A 50-item household safety checklist was constructed. Guided by a participatory action research (PAR) framework, HHC aides worked with study investigators to develop the checklist and fact sheet to provide resources and contact information for low-/no-cost remediation of identified hazards. To provide HHC aides with the necessary skills to conduct household safety surveys, a 1-hour training program was developed. Pre/post-testing was performed to evaluate the effectiveness of the training.

Results: Fifty-seven home care aides were trained on household hazards and conducting household safety surveys using the checklist. The aides successfully implemented the checklist in the households of their elderly clients (N=116). Of 30 household hazards, a majority (85.3%) of the patient households had one or more hazardous conditions (range 1-13). The most prevalent household hazards were the lack of a fire extinguisher in the home (47.0%), lack of non-slip shower mat or pads in the shower/bathtub (32.8%), lack of a carbon monoxide alarm (30.4%), and lack of grab bars in the bathroom (25.0%).

Key Words: safety, home healthcare, households, falls

PURPOSE

The overall goal of this 1-year pilot project was to develop a low-cost, low-technology, safety survey tool to effectively identify and characterize household safety hazards in the home healthcare (HHC) setting. The tool was developed and field tested with the active engagement of front-line workers using participatory action research (PAR) methodology.

Household hazards have the potential to affect quality of patient care, patient safety, healthcare outcomes, and cost. These hazards could also adversely impact the health and well-being of HHC workers. Therefore, this project was an important first step in reducing the risk of injury and illness related to household hazards for both HHC patients and providers.

The issue of household safety is significant for several reasons. First, homes can be unsafe environments. One third (approximately 42,600) of all unintentional fatalities in the United States and one third of all disabling injuries (approximately 10,200,000) occur in the home. The direct cost of these injuries exceeds $150 billion a year for medical care alone.[1] Second, an increasing proportion of healthcare now occurs in the home. The HHC sector, with nearly eight million patients, is the fastest growing sector in healthcare, with an estimated 47% growth expected by 2014.[2] Third, studies suggest unsafe homes may present special risk to vulnerable HHC patients.[3-5] Fourth, data addressing the impact of the home environment on the health and safety of HHC employees, though sparse, raise concerns. Data from an earlier study we conducted on occupational health hazards in HHC document a high prevalence of hazards and a significant association between the frequency of exposure to various household hazards and adverse outcomes in both registered nurses and paraprofessionals. Some of these outcomes (e.g., shortened length of visits) could impact both patient safety and quality of care. This observation has broadened the interest to consider household hazard risk to patients in this setting. Fifth, clearly defined and well-validated safety tools are lacking in the HHC sector. The household safety survey tool provides the basis for hazard identification and guides the development of targeted risk reduction interventions.

Accordingly, the specific aims of this study were as follows:

1. To develop and validate a novel household safety survey tool tailored to the HHC environment using a PAR framework.
2. To field test the tool in a sample of 100 HHC patient households located in New York City (NYC).
3. To assess the feasibility of using the safety survey tool.

To meet these specific aims, we collaborated with the largest HHC agency in NYC, the Visiting Nurse Services of New York (VNS-NY).

This project addressed several of AHRQ's priority areas, including translation of research into practice and policy, patient safety and quality, patient-centered care, and priority population research (e.g., inner city, low income minorities and elderly patients). This project also addressed the Centers for Disease Control and Prevention's Healthy People 2010 injury prevention objectives.[6]

This study was innovative for several reasons: 1) it targeted a large and vulnerable patient population, 2) it addressed an important yet understudied safety area (i.e., homecare households), 3) the study involved the active participation of front-line caregivers, and 4) a well-validated novel tool, with the potential of widespread applicability, was developed and tested.

SCOPE

Background: The groundbreaking 1998 Institute of Medicine (IOM) Report, "To Err is Human," provided startling evidence on the magnitude of adverse events in hospitalized patients and underscored the need for improvements in patient safety.[7] The second report, "Crossing the Quality Chasm," provided further stimulus for addressing problems in the quality of patient care and strongly recommended a "systems-level approach" in addressing this issue.[8] This approach, referred to by Leape and Berwick as a "mantra in healthcare," is based in part on lessons learned from high-hazard work organizations, or "high-reliability organizations" (HRO), such as aviation, nuclear power plants, chemical manufacturing, and other industrial settings.[9] In these organizations, where error can result in catastrophic outcomes, extensive safety systems, including system-wide policies, procedures, and technologies with extensive redundancies, have been developed and implemented to reduce the likelihood of adverse events.[10] This approach has resulted in strong safety cultures and exemplary safety records for HROs.[10] The five basic tenets of systems-level safety adopted by the HROs are as follows: (1) acknowledgement and identification of the risks; (2) nonpunitive response to reporting of incidents, near misses, or unsafe behaviors; (3) joint effort (labor and management) and team-focused partnership for addressing safety issues; (4) provision of financial resources to support safety programs, redundant safe guards and safe technology; and (5) monitoring, feedback, and analysis of safety data.[11-13]

These basic tenets serve as the foundation for a strong safety culture and climate. In healthcare organizations, safety culture and climate are particularly important because they are correlated with compliance with safe work practices, including reporting of unsafe conditions and "near misses," and have also been correlated with adverse patient and employee safety and health outcomes.[14-18] The challenge in healthcare, given the clear mandate provided by the IOM and the growing body of evidence-based research on patient safety, has been to apply the basic tenets of systems-level safety. Since the IOM report was first published, efforts have been made throughout the healthcare industry to reduce adverse patient events, although there is evidence that much work remains.[19-21]

Patient safety, defined by the IOM as the "prevention of harm to patients, with harm occurring through errors of commission and omission" is, in some ways, much more complicated in HHC compared to hospitals. The HHC environment is both a home and a caregiving environment, and it is a workplace for the caregivers. HHC patients may be at risk of adverse events caused by medical management or medical errors as well as from adverse events related to household hazards. Hazardous conditions in the home may potentiate the risk of medical error and adversely impact the quality of care. Workers similarly may be at risk in the HHC setting. First, they may be at risk of occupational injury/exposures similar to those found in other healthcare settings (e.g., needlesticks, back injuries), and second, they may be exposed to household-related hazards (fire hazards, poor air quality, aggressive pets, etc.). Compared to hospitals, households are much more unstructured and unpredictable settings for delivery of patient care. Both professional and paraprofessional staff members in the HHC sector are often less supervised than healthcare workers in hospitals and have far less co-worker support. Though family and friends of the patients can be helpful in HHC, they also can sometimes interfere with caregiving. Finally, many of the expected protections we take for granted in a healthcare workplace (such as onsite safety personnel, routine fire safety drills, etc.) are not in place in the home setting. HHC has received very little attention from the patient safety community, although interest is increasing. The development of a strong safety climate is challenging at best in HHC, and applying the five basic tenets of a systems-level approach to safety management may be difficult, especially given the ever-increasing financial constraints faced by the HHC sector.

This project was designed to develop a safety survey tool and a framework for implementing the tool and maximizing its utility. This straightforward, low-cost approach is the first step to addressing many of the five basic tenets of systems-

level safety. The tool, and its implementation, will contribute to the development of a strong (i.e., positive) safety culture and climate in this setting.

Context: Quality improvement in HHC is monitored through the uniform patient-level data set, the Outcomes and Information Set (OASIS).[35] The Centers for Medicare and Medicaid Services (CMS) developed a quality initiative, the Outcomes-Based Quality Improvement (OBQI), which is based upon the OASIS data.[36] The OBQI identifies 13 adverse care indicators, grouped into nine domains; of these, a single domain addresses accidents (prevalence of any injuries). Through this mechanism, the federal government regulates quality in HHC settings, but only in agencies certified by Medicaid and Medicare. In general, the difficulty of regulating quality in this setting is well recognized,[37] and only a few studies of HHC quality, usually focused on medication errors, have been published; all document serious deficiencies.[38-40] And many of the same well-defined hazards related to healthcare, such as nosocomial spread of infectious agents, development of resistant organisms, medication errors, etc., may also be found in the HHC setting.[41-43] For example, Meredith et al (2001) found that about one third of elderly homecare patients had potentially serious problems with their medications.[40] A recent study on adverse events using the OASIS data set found that 3.3% of the over three million HHC patients studied had reports of emergent care related to a fall or accident.[44] Though the use of OASIS indicators is an important step in addressing HHC quality, the OASIS indicators are not designed to address household hazards. OASIS data is collected at intake, at discharge, at least every 60 days, and when several other conditions occur. With respect to household assessment, anecdotal reports from agencies indicate that basic assessments of the household are sometimes conducted at intake, especially if there is an occupational therapist assigned. However, there is no routine mechanism in place for follow-up of recommendations to improve household safety by addressing or removing hazards.

Household hazards can result in adverse outcomes. On average, 30% (approximately 42,600) of all unintentional fatalities in the United States occur in the home setting.[1] In terms of injuries that are related to the home, more than 10,200,000 disabling incidents occur on average each year in the United States. The cost of these incidents is over $150 billion a year in medical costs alone, exceeded only by the medical costs related to automobile accidents and work accidents ($258 and $164 billion, in 2006, respectively).[1]

The leading types of injuries in the home are falls, poisoning, and burns. The elderly are especially at risk; each year close to two million older adults are injured in the home and the rate of falls and fatalities due to falls, in the community and in institutions, is greatest in people 70 years and older.[46-48] For example, people who are 70 years and older have roughly a four fold to five fold increase in fatal falls compared to those in their 60s and a 25 fold increase compared to people who are less than 60 years of age.[46, 48] The elderly not only have a high incidence of falling (35-40% of elders in the community fall each year) but also have a high incidence of serious injuries when they do fall, and even minor falls can result in fracture, laceration, or the need for hospitalization.[48-50] Falls have been shown to result from a combination of factors, including the victim's health status, medical treatment (e.g., medications), and environmental factors (e.g., loose rugs, improper footwear, poor lighting, uneven or broken steps, missing handrails and grab bars, etc.). A meta-analysis of falls prevention programs found that the most effective of these programs were those that addressed other major risk factors, including environmental modification.[46]

Setting: The HHC sector is large, employing over 1.3 million workers in a variety of occupations.[22] Most growth occurred after the enactment of Medicare in 1965, followed by dramatic growth after the 1987 revisions to Medicare, which led to facilitated reimbursement to HHC agencies.[23] Currently, there are nearly 18,000 HHC agencies in the United States providing care to nearly over seven million individuals. This most likely represents only a fraction of the true number of HHC patients, because many receive pay-for-service or formal care through non-Medicare-certified agencies or from informal caregivers, such as family and friends.[23]

With the annual US expenditure for HHC over $50 billion per year, the scope of HHC is broad and covers a very wide range of services, from assistance with daily living activities through more complex care provided to post-surgical or chronically ill patients. Even with increasing acuteness of care that is provided in the home setting, the cost of HHC is significantly less per day than a nursing home or in-patient hospital stay (in 2006, $125 vs. $535 vs. $5,036, respectively) and is increasingly favored by patients and families.[23]

HHC is delivered, in general, by three types of agencies: certified HHC agencies (CHHAs), long-term HHC programs (LTHHCPs), and licensed HHC services agencies (LHCSAs). CHHAs are authorized to serve both Medicare and Medicaid recipients in need of short-term, skilled nursing care and to provide nursing, home health aide, personal care, homemaker, and housekeeper services. LTHHCPs, also known as "nursing homes without walls," provide services that enable nursing home eligible individuals to remain at home. Finally, LHCSAs provide, either directly or through

contract with another program, at least one of the following services: nursing, home health aides, personal care, private duty nursing, homemakers, and physical/occupational and speech therapies.[24] Agencies can be private for-profit, private non-profit, or public non-profit and affiliated or unaffiliated with a hospital.

Participants

HHC Workers: In addition to over 115,000 registered nurses providing skilled nursing care or supervision in HHC and about 25,000 other professional staff, a large HHC workforce estimated at 775,000, composed of home health aides, home attendants, and personal care workers provides the bulk of the day-to-day care in the HHC setting.[23,25] Under medical direction, though without direct supervision, home health aides provide basic services that allow patients to convalesce outside of the traditional hospital setting. They check the patient's vital signs, conduct physical therapy, change dressings, and assist with the use of medical equipment. In addition, they may provide other services that neither the patient nor his or her family are able to provide on their own, such as ambulating, bathing, and grooming the patient.[25] The home health aide may also be asked to perform light housekeeping. Personal care workers and HHC attendants, commonly referred to as "personal assistants," provide more personal assistance to patients in the home. There is growing interest in engaging HHC aides in more professional activities; conducting household safety surveys is one way that aides could become more involved in patient safety.

Even though the HHC workforce is large, the projected need is great, with perhaps twice as many HHC employees needed by 2030.[26] This is especially problematic given that the workforce itself is undergoing similar demographic age shifts and, as is the case with the nursing profession, is steadily experiencing increasing shortages for a range of reasons. It is important to note that, in the very few studies on HHC workers that have been conducted, they appear to have an increased incidence of injury compared to other healthcare and human-services workers.[27-29]

HHC Patients: The patient population served by HHC is large, growing, and increasingly frail and elderly. Many HHC patients may also be at increased vulnerability due to disabilities and socioeconomic factors. According to the US Department of Health and Human Service's 2007 *National Home and Hospice Care Survey*, there were 1,459,900 current home healthcare patients in 2007, representing a 7.7% increase from 2000. Of these patients, about 69% are over age 65, approximately 64% are women, and 82% are White.[30]

United States demographics are changing in ways that will affect HHC. Perhaps the most significant factor affecting HHC is the aging post-World War II ("baby-boomers") cohort. The first wave of the cohort will reach age 65 in 2012, and by 2032 the cohort will have reached age 85.[32] This will result in a dramatic increase in the number of older Americans. For example, in 1960, 16.2 million people in the US were 65 years and older; by 2000, that number increased to 35 million, and this is projected to increase to 87 million by 2050.[32, 33] There is an even greater magnitude of growth projected for the extreme elderly cohort. In 1960, less than one million Americans were 85 years and older; by 2030 nearly 10 million Americans will be 85 years and older.[34] These shifts are due to not only the sweeping population demographic changes, but also to improvements in US mortality. Together, the result will strain the services provided to the elderly, including HHC services.

Patients increasingly enter HHC with highly complex medical problems and multiple diagnoses, thus requiring a greater intensity of care.[23] According to 2010 Medicare statistics, the most commonly treated diagnosis for HHC patients are circulatory system disease diagnoses (27.6%), followed by diseases of the musculoskeletal system and connective tissue (12.2%) and endocrine, nutritional, and metabolic diseases and immunity disorders (11.5 %).[31]All these trends suggest that HHC will become more challenging and the expectations placed upon the home sector caregivers are therefore likely to become more demanding, potentially increasing the risk of adverse household safety-related events. By increasing our awareness and understanding of the health hazards inherent to the HHC environment, it may be possible to reduce the risk of injury and illness to the HHC patient and to improve the quality of work life for the caregiver.

Prevalence: The few studies that have examined other types of home hazards generally note numerous unsafe conditions. For example, the prevalence of carbon monoxide detectors in homes with adults who are 70 years old or older was found to be only 28% and, although 97% of all homes reported smoke alarms, only 69% reported having fire extinguishers (only 41% of apartment dwellers), and only 35% in households with occupants who are 70 years old or older had fire escape plans.[51] Safety researchers have advocated for improved housing conditions to improve the health and well-being of vulnerable occupants.[52-55]

The HHC setting is a challenging work environment not only in terms of patient safety as measured by the OASIS indicators but also in terms of household hazards that may present risk to HHC patients, especially patients who are elderly.

Residential settings may have various household-related hazards (e.g., slips/trips/falls hazards, poor indoor air-quality, lead paint, toxic substances, violence and abuse, etc.) that are associated with numerous negative health effects.[52, 56-66] At the same time, as noted, employees are often working alone, without safety devices, such as assistive lifting devices, safety needles, and sharps containers, and without benefit of safety personnel or infection control practitioners. Furthermore, there may be role ambiguity, as some workers may be treated as family and/or guests and not as healthcare providers. Last, limited safety training is generally provided, especially by some of the smaller agencies.

A previous study led by Dr. Gershon on occupational health and safety hazards in the households and neighborhoods of HHC patients yielded the most complete assessment of this issue to date. Data from 1561 HHC workers who reported on their patients' households indicate high prevalence of certain unsafe conditions along with substantial reports of injuries and exposures, with psychological abuse, animal hair, cockroaches and mice being the most commonly reported. In another large survey of registered nurses (RNs) (N=738) employed by HHC agencies throughout New York State, data were collected on hazardous household conditions and self-reported occupational injuries/illness. The vast majority of the RNs were women (95%), average age was 49.9, and average tenure in HHC was 21.6 years. The most prevalent hazardous conditions were airborne allergens, vermin, and unsanitary conditions. Nearly one of four RNs (19%, n=142) reported experiencing an injury in the past 3 years. The majority of these injuries were back injuries, (n=68, 48%), upper-extremity injuries (n=38, 27%), and lower extremity injuries (n=37, 26%). More than half of the back injuries occurred during patient care. Less than three quarters of the RNs reported receiving occupational safety training on their current job. Training, when provided, focused on body mechanics, infection control, and personal safety.

METHODS

Study Design: This 12-month study involved active participation of a team of HHC aides. Working within a PAR framework, eight aides assisted the development of a draft safety survey tool. Three PAR meetings were conducted as follows: 1) to review and provide input on draft tool, 2) to review the final tool and receive training and instructions on its use, and 3) to hold a final meeting to review results and provide feedback on the survey experience.

Prior to reviewing the safety survey tool with the HHC aides, the expert study consultants provided input regarding construct and content validity of the tool. Once the draft tool was finalized, a team of aides (N=57) was trained on using the tool to conduct field tests in approximately 100 patient households. After all surveys were conducted and analyzed, the team of HHC aides reconvened to review the findings and provide feedback on the survey experience. The overall study was organized into four distinct phases to assure the orderly and timely management of the study, as shown below in **Table 1**.

Table 1. Outline of Study Management Plan

Phase 1: Formative Stage and Safety Survey Tool Development (months 1 - 6)	**Phase 2: Data Collection (months 7 – 8)**	**Phase 3: Data Analysis (months 9-10)**	**Phase 4: Review, Preparation and Dissemination of Findings (months 11-12)**
• Begin study operations manual • Develop database/ data management system • Finalize all IRB-related documentation including human subjects protection provisions • Review sample household safety surveys[58, 94] • Create items of draft tool and the safety resources fact sheet with experts to establish validity • Prepare draft safety resources fact sheet (NYC public housing-specific) • Recruit HHC aides • Review draft household safety survey tool in collaboration with PAR teams (HHC aides) • Training of PAR teams in conducting the surveys • Recruit patients for field testing of the tool • Process evaluation	• Aides conduct household safety surveys using the new tool • Aides complete the safety resources fact sheet • Process evaluation	• Data cleaning, data analysis • Preparation of data for aides using quality management techniques • Process evaluation	• PAR teams review data and data collection process and provide feedback • Prepare final reports and presentation of findings to consultants/organizations • Prepare oral presentations and draft manuscripts • Process evaluation • Complete study manual

Data Sources/Collection: In the formative phase (Phase 1), the study team collected and reviewed relevant existing household safety information and sample surveys.[59, 95] These sample surveys served as a means of assessing convergent validity of the safety survey tool. The draft tool was prepared by the study team with the help of a panel of expert study consultants to establish construct and content validity. The draft safety survey tool was then reviewed by HHC aides (N=8) during a 1-hour PAR team meeting. All recruitment procedures were facilitated by the collaborating partner,

VNS-NY, and all PAR meetings and trainings were held at Partners in Care, an affiliate of the VNS-NY. HHC aides were asked to provide feedback and recommendations for the final safety survey tool as well as recommendations for training sessions. HHC aides received a small honorarium of $25 each for their participation in the meeting. The draft safety survey tool was modified, to incorporate the feedback and recommendations provided by the participating HHC aides, by the study team and expert consultants (**Specific Aim 1**). The safety resources fact sheet was also created by the study team and expert consultants. Aides were instructed to note on the fact sheet the identified hazards and the appropriate follow-up procedures. A uniform set of procedures (with appropriate contact phone numbers) was provided for the remediation of hazards outside the purview of the patient (i.e., intercom not working, refrigerator not functioning, exposed outlets, vermin, etc.). The fact sheet allowed aides to provide patients with information on follow-up procedure or contacts. Start, stop, and approximate length of time to complete the survey was also included on the tool. The final version of the survey was formatted in a user-friendly format (**Appendix B**). The tool was prepared at a 5th grade reading level to allow for rapid completion.

HHC aides (N=57) were recruited to receive training and instructions for implementing the tool and to receive information on household hazard remediation. HHC aides were asked to attend one of three 2-hour training sessions led by Dr. Gershon at Partners in Care. The criteria were as follows: one or more years of HHC work experience, English speaking, current patient load of at least two patients per week enrolled in home care, and patient households located in Manhattan. The training included group-level cognitive testing to ensure that all of the survey items were clearly understood. The training session also provided explicit instructions on completing the survey tool. Standard PowerPoint slides were developed so that a uniform training program was provided at each of the training sessions. To assess the effectiveness of the household hazard training intervention a six-item pre/post test was designed. HHC aides were given a study packet that included a consent form to participate in the training, a pre-test, two household safety surveys and two consent forms to be completed by participating patients, and a post-test. “Goody” bags were also provided with safety materials and brochures available in Spanish and English. Each aide received a goody bag for his or her own use and one per each patient participating in the survey. Goody bags contained items that were provided free of charge by several NYC agencies (e.g., FDNY, Poison Control, DOH, etc.); these included safety educational brochures in English and Spanish, medicine storage boxes, oven mitts and replacement smoke detector batteries. To ensure completeness of consent procedures and the validity of the pre-test responses, the consent form to participate in the training and pre-test was attached to the outside of the study packet. After informed consent procedures, HHC aides were instructed to complete the pre-test without looking through the study packet.

The household safety survey was then field tested by the participating HHC aides with their elderly home care patients (**Specific Aim 2**). Patient eligibility criteria included residence located in Manhattan, receive HHC services, and provide signed consent. In addition to completing the survey, aides were instructed to review the necessary follow-up procedure or contact on the factsheet to mitigate the identified hazards. A copy of the safety resources fact sheet was provided to each patient. The completed survey, with the attached copy of the completed consent form, was returned to the study office in pre-addressed, pre-stamped envelopes provided to the aides. HHC aides were instructed to immediately report <u>any imminent life safety or serious injury hazards</u> (e.g., blocked fire exit egress, gas leak, lack of electricity or heat, etc.) to the appropriate authority and to the homecare agency. The aides were provided with one pre-addressed pre-stamped envelope that they used to return two completed surveys to the study office. Aides had 2 months to complete all surveys. The study office periodically checked-in (by phone) with each aide to assess progress and answer any questions. The incentive for completing all surveys ($25) was mailed to the HHC aide when completed surveys were returned to the study office.

Data from the safety surveys and hazards circled on the fact sheets were entered into a Microsoft Excel file by the project coordinator and converted into SPSS data files for analysis. All electronic data were linked to the patient households unit using a unique identifier, and encrypted to maintain its security. Data were stored on secure (locked) computers, both passcode and virus protected, and backed-up on our network on a daily basis. All data storage was HIPAA compliant. Only the PI and study coordinator had access to the master codebook, which has contact information on the aides, for follow-up purposes. This information was similarly secured. No data were kept on laptops, flash drives, or any portable computer devices. The project coordinator monitored the growing data set (data entry was ongoing and concurrent with collection). Construction of the final dataset commenced at the end of the data collection and data entry.

HHC aides who completed PAR safety survey tool training and participated in the field-testing were invited to attend one final meeting at the end of the study. Using quality management techniques, the data collected from the safety survey tool was prepared so that it is accessible to non-scientists.[106] Information on household hazards was reviewed by

participants for their feedback and comments. The aides were asked to provide their feedback, both on the data findings as well as the process and feasibility of utilizing this more generally.

Measures: Pre/post data from the training program, coded for confidentiality, and all data from the safety checklist were entered into Microsoft Excel files and converted into SPSS data files for analysis. All electronic checklist data were linked to each patient household using a unique identifier and were encrypted and virus protected to maintain security. All data storage was HIPAA compliant. No data files were stored on laptops, flash drives, or any other portable computer devices. The project coordinator monitored the growing data set (data entry was ongoing and concurrent with collection). Construction of the final dataset commenced at the end of all data collection and data entry. Safety checklists that were missing substantial amounts of data were excluded from the analysis, resulting in a sample of 116 households. After data editing procedures were completed, exploratory data analysis using SPSS16.01 (Chicago, IL) was conducted to fully characterize the sample of safety checklist data. An array of descriptive techniques and graphical techniques was utilized to characterize the distribution of the hazards. We determined frequency of hazards for the sample as a whole. The pre/post analysis consisted of a paired samples t-test and effect size was calculated utilizing Cohen's (1988) d statistic. Pearson's chi-squared tests were used to test the significance of relations between categorical items. Odds ratios were calculated when appropriate.

Limitations: Many potential study limitations were recognized. Several aspects of the study design could potentially lead to selection bias and threats to generalizibility. For example, we sampled employees and patients recruited through only Partners-in-Care, an affiliate of VNS-NY, although aides worked for many different NYC HHC agencies. This sampling strategy may have inadvertently selected employees and/or patients who are not truly representative of NYC agencies or the sector as a whole. Also, aides may have self-selected into the study because they already provide care to patients who happen to reside in safe households. Similarly, they may have selected patients in their care load with particularly safe households. We countered this by encouraging them to give recruitment packets to the first two patients on their roster for a given week. Because this was a pilot study, we were primarily interested in learning if this method is feasible, useful, and acceptable to aides and patients. Our results may not be generalizable to the entire HHC network, because we only recruited from New York City. However, this method may have applicability to any urban setting. With modifications, the tool may also have utility in any HHC households.

Another study limitation is data collection variability. Some aides may have been more or less observant of safety hazards in their patients' households. Data collection variability was minimized by the participation in a 2-hour training program.

The checklist was designed for urban apartment dwellers; it would have to be adapted for use in other types of dwellings, including single family and group homes. This is especially true for dwellings with multiple levels and with stairs. It was developed in English, and ideally it should be developed in other languages most suitable for the HHCP population. Similarly, safety information included in the goody bags should be made available to the patient in the appropriate language. As new hazards can continuously arise (or be introduced into the household), the inspection needs to be implemented on a routine basis. Finally, the ever increasing decrease in work hours for HHCPs may preclude the appointment for time to conduct inspections.

RESULTS

The following results are preliminary. Final results will be published in a peer-reviewed journal.

Training Program: The training program was effective in increasing HHCPs familiarity with household hazards. Results of the paired samples t-test indicated that there was a statistically significant mean difference between scores on the baseline assessment (Mean [M] = 4.17, Standard Deviation [SD] = 1.04) and post-training assessment (M = 5.35, SD = 0.89), $t(53) = 7.80$, $p < .001$, $d = 1.06$ (95% CI = .79 – 1.33).

Household Safety Checklist Data: Data from completed checklists for 116 unique households were analyzed (**Table 2)**. Of 30 household hazards, a majority (85.3%) of the patient households had one or more hazardous conditions (range 1-13). Sixty-two percent had three or more hazards, and 35.4% had five or more hazards present. Of the households with one or more hazardous conditions, HHCPs identified 3.9 hazards on average. The most prevalent household hazards were the lack of a fire extinguisher in the home (47.0%), lack of non-slip shower mat or pads in the shower/bathtub (32.8%), lack of a carbon monoxide alarm (30.4%), and lack of grab bars in the bathroom (25.0%). The next most common hazard

was lack of an emergency contacts list (e.g., list of names of family, friends, neighbors, to contact in case of medical or other (e.g., power failure) emergency) (24.1%) (See **Table 3**).

Table 2. Patient Characteristics (N = 116)*	
Characteristics	**n (% Reporting)**
Gender	
Female	81 (70.4%)
Male	34 (29.6%)
Age	*M* = 75.7 yrs
	SD = 12.1 yrs
Ability to Walk Unassisted	
Yes	41 (38.3%)
No	66 (61.7%)
Overall Self-Reported Health Status	
Poor	6 (5.4%)
Fair	76 (68.5%)
Good	28 (25.2%)
Excellent	1 (0.9%)
Wears Hearing Aid	
Yes	9 (7.9%)
No	105 (92.1%)
Number of people living in the home	
1 person	65 (59.1%)
2-3 people	38 (34.5%)
4-5 people	7 (6.4%)
HHCP knows the patient's daily medications	
Yes	70 (67.3%)
No or N/A	32 (32.7%)
Patient's Medicine Tracking	
"Pre-poured" or placed in a pillbox	77 (68.1%)
Medicines lined up	19 (16.8%
Other method	13 (11.5%)
No method to keep track	4 (3.5%)
Patient keeps medicine in the home that they are no longer taking	
Yes	29 (26.1%)
No	82 (73.9%)
*Values may not add to 116 due to missing responses.	

***Falls hazards*:** More than half (57.8%) of the households had at least one of the 10 items related to falls hazards (see Table 2). The number of falls hazards ranged from 1 to 7, with a mean of 2.4 hazards. Of these patient households, 41.8% had three or more such fire hazards. The lack of non-slip shower or bathtub mats, grab bars, and non-slip bathroom rug (23.3%) were the most prevalent falls hazards, followed by loose or worn-out rugs (16.4%), poor lighting (9.5%), and dangerous electric cords that are easily tripped over (9.5%).

***Fire hazards*:** The most frequently observed household hazard was related to fire safety. Although not a requirement for NYC households, fire extinguishers are highly recommended; 47.0% of the households inspected lacked this basic fire safety device. Of those with a fire extinguisher, only two households had a fire extinguisher with a working pressure gauge. Another common hazard was the lack of CO detectors; approximately a third of the households lacked this required-by-law safety device. Of nine fire hazard items, a majority (68.4%) of the households had one or more fire hazards (range 1-3), with a mean of 1.6 hazards. Approximately one third of these households had two or more fire hazards; 14% had three fire hazards.

***Biological and chemical hazards*:** Cockroaches (19.0%) were frequently observed in the households, along with rats or mice (9.5%), and other bugs (6.0%). Issues with food storage and rotten food were also identified as hazards by the HHC aides. Cleaning products and other potential poisons not stored in the original containers (original labels are not in place) was identified as a chemical hazard.

Other miscellaneous hazards: The lack of an emergency contact list was often found in the households, which was listed as a hazard because emergency response could be delayed if the emergency contact list was absent.

Regarding excessively loud noise in the home (from within or outside the home/apartment), this hazard was observed in a small proportion (6.9%). Similarly, doors lacking suitable locks (e.g., deadbolts, chain lock, peep hole, etc.) was found in 6% of households. In one case, the threat of violence, such as aggressive dogs and other pets, neighbors, or weapons, was observed.

Table 3. Safety Checklist Household Hazardous Conditions (N = 116)

Hazard Categories	n (% reporting)
Falls hazards (Ergonomic)	
No non-slip shower mat or pads in the shower/bathtub	38 (32.8%)
No grab bars to get in/out of shower/bathtub	29 (25.0%)
No non-slip rug on bathroom floor next to shower/bathtub	27 (23.3%)
Loose or worn-out rugs or carpets	19 (16.4%)
Poor lighting	11 (9.5%)
Uneven or slippery floors	10 (8.6%)
Excessive clutter	10 (8.6%)
Awkwardly placed furniture (blocking exit)	5 (4.3%)
Fire/Electrical hazards	
No fire extinguisher	54 (47.0%)
No carbon monoxide alarm	35 (30.4%)
No smoke alarm	15 (13.0%)
Electrical cords (e.g., overloaded outlets, damaged cords)	11 (9.5%)
Unsafe smoking materials	2 (1.7%)
Dangerous space heater (uses flammables)	1 (0.9%)
Stove knobs hard to reach	1 (0.9%)
Flammables (e.g., towels, curtains, paper) near stove tops	0 (0.0%)
Biological or unsanitary hazards	
Signs of cockroaches	22 (19.0%)
Signs of rats or mice in the home	11 (9.5%)
Excessive dust or animal hair	8 (6.9%)
Signs of other bugs (e.g., bed bugs, fleas, or lice)	7 (6.0%)
Mold or fungus	7 (6.0%)
Non-food and food items stored in the same cabinet	4 (3.4%)
Rotten food or milk in the home	4 (3.4%)
Trash build up in home	2 (1.7%)
Food not generally stored in a sanitary manner	1 (0.9%)
Other miscellaneous hazards	
No emergency contact list available (e.g., information for family members, doctor, superintendent, etc.)	28 (24.1%)
Excessively loud noise in the home (from inside or outside the home/apartment)	8 (6.9%)
Doors are lacking suitable locks (e.g., dead bolts, chain lock, peep hole, etc.)	6 (5.2%)
Threat of violence, such as aggressive dogs and other pets, neighbors, or weapons	1 (0.9%)
Chemical hazards	
Cleaning products and other potential poisons are not in the original containers (original labels are not in place)	2 (1.7%)

Safety and Medical Devices: Assistive devices in the households were common. A large proportion (45.1%) of patients used a cane, a slightly smaller proportion of clients (42.0%) used a walker, and 26.8% used a wheelchair. Over 80% of HHCPs who assisted patients with a cane, walker, or wheelchair were trained to assist their patient in its use. Safe lifting devices were rarely observed; only 5.2% of households had them. Approximately two thirds of the HHCPs who work in households with safe lifting devices were trained on their use. Other medical equipment noted during inspections included oxygen tanks (7.0%), nebulizers (6.1%) and ventilators (1.8%). Three quarters of HHCPs who assisted their patients with an oxygen tank were trained on how to use/store/handle them. Similarly, 71.4% of HHCPs were trained on how to assist their patients use a nebulizer, and both HHCPs whose patients use a ventilator were trained on how to assist their patients use the device. Approximately one fifth of the households had a portable toilet, and 90.9% of HHCPs working in these households were trained to assist patients with portable toilet use. Needles and other sharps were observed in 11.3% of households, and a majority of these households (88.9%) had a sharps container. A shower chair was identified in one household, and the HHCP in this household was trained to use the device.

***Bivariate Results*.** Ability to walk without assistance and gender were associated with household hazards. In particular, patients who walk with assistance are 2.5 times more likely to have one or more falls hazards in their household

[X2(1) = 5.0, p < .05, OR = 2.5 (95% CI = 1.1 – 5.5)]. Women are more likely to have more household falls hazards (above the mean of 3.9) [$X^2(1) = 8.40$, p < .01, OR = 4.2 (95% CI = 1.5 – 11.7)]. Similarly, women are approximately two times more likely to have falls hazards (vs. none) and roughly four times more likely to have fire hazards (vs. none) than men [$X^2(1) = 4.0$, p < .05, OR = 2.3 (95% CI = 1.0 – 5.1) and $X^2(1) = 9.2$, p < .01, OR = 3.7 (95% CI = 1.5 – 8.7), respectively].

Length of time. The average safety checklist took less than 20 minutes to complete.

Feedback from PAR Team Members. The patients were generally very willing to have the HHCP conduct the visual inspection. Most patients (95.7%) were interested in the goody bag, and an overwhelming majority (99.0%) found the fact sheet helpful. In many cases, the HHCPs reported that their patients, and in some instances, their family members, accompanied them on the visual inspection and were quite engaged in the process. The HHCPs reported that the training session helped them to complete the checklist for their patient. A majority (97.7%) of the team members found the process easy, and no difficulties using the checklist were reported. The photo illustrations made it simple to use the checklist. Although they had typically been in the patients' homes many times before, the tool provided the structure for actually "seeing" the hazard that, as one HHCP stated, "was right under their noses."

DISCUSSION

The Occupational Safety and Health Administration has identified four major elements of effective safety programs These are 1) senior level management commitment to safety and employee involvement, 2) worksite analysis of hazards, 3) hazard prevention and control programs, and 4) safety and health trainings.[91] This project addressed all four of these key factors in safety: we had commitments from senior level personnel at VNS-NY and Partners-in-Care, and we developed and implemented the safety survey tool for hazard identification analysis, which will hopefully lead to prevention and control programs. Finally, front-line workers were involved in developing the safety survey tool and trained to use it in the field. A groundbreaking study on residential health hazards by Dr. Susan Klitzman, one of the expert consultants on this research, found that visual assessments conducted by community members were well correlated with environmental sampling data.[66] Similar findings have been published in the "healthy homes" literature.[92,93]

With the input of a team of front-line HHCPs, an easy-to-use household safety checklist was developed. It was simple to use; HHCPs with limited English language literacy were able to use it to conduct visual safety inspections of their patients' homes. The checklist was instrumental in identifying numerous varied household hazards and was well-accepted by patients. Use of the tool no doubt facilitated the inspections, which on average took less than 20 minutes to complete. The real value of the checklist is only realized when the identified hazards are remediated.

Conclusions and Significance: **The leading types of injuries in the home are falls, poisoning, and burns. The elderly are especially at risk** for all three; each year close to two million older adults are injured in the home and the rate of falls and fatalities due to falls, in the community and in institutions, is greatest in people 70 years and older.[39-41] For example, people who are 70 years and older have roughly a four fold to five fold increase in fatal falls compared to those in their 60s and a 25 fold increase compared to people who are less than 60 years of age.[40, 42] The elderly not only have a high incidence of falling (35-40% of elders in the community fall each year) but also a high incidence of serious injuries when they do fall, and even minor falls can result in fracture, laceration, or the need for hospitalization.[41-43] Falls have been shown to result from a combination of factors, including the victim's health status, medical treatment (e.g., medications), and environmental factors (e.g., loose rugs, improper footwear, poor lighting, uneven or broken steps, missing handrails and grab bars).[44] Both meta-analysis and prospective studies of falls prevention programs found that the most effective of these programs were those that addressed other major risk factors, including environmental modification.[40, 44]

The few studies that have examined other types of home hazards generally note numerous unsafe conditions. For example, the prevalence of carbon monoxide detectors in homes with adults who are 70 years old or older was found to be only 28%, and, although 97% of all homes reported smoke alarms, only 69% reported having fire extinguishers (only 41% of apartment dwellers); only 35% in households with occupants who are 70 years old or older had fire escape plans.[45] Other household environmental conditions that could lead to adverse outcomes, especially in the elderly, include poor ventilation, excessive heat, cold, and noise, aeroallergens related to dust, mold, and vermin infestation, peeling paint (lead), pesticides and other toxic chemicals. Public health researchers have advocated for improved housing conditions to positively impact the health and well-being of vulnerable occupants.[7, 46-49]

Patient Safety in Home Healthcare: Quality improvement in HHC is monitored through the uniform patient-level data set, the Outcomes and Information Set (OASIS).[14] OASIS data are collected at least every 60 days, at intake, at discharge,

at a significant change in patient condition, including death, upon return to HHC after a hospital stay, or when patients are transferred. The Centers for Medicare and Medicaid Services (CMS) developed a quality initiative, the Outcomes-Based Quality Improvement (OBQI), which is based upon the OASIS data.[15, 16] The OBQI identifies 13 adverse care indicators; a single domain addresses injuries resulting from falls or accidents in the home. Through this mechanism, the federal government regulates quality in Medicaid- and Medicare-certified HHC agencies. A recent study on adverse events using the OASIS data set found that 3.3%, or 12,861, of the over three million HHC patients studied had reports of emergent care related to a fall or accident.[17]

Though the use of OASIS indicators is an important step in addressing HHC quality, the OASIS indicators are not designed to address household-related hazards, and the difficulty of regulating quality in this setting is well recognized.[18] The few published studies of HHC quality usually focused on medication errors (all document serious deficiencies).[19-21] For example, Meredith et al. (2001) found that about one third of elderly HHC patients had potentially serious problems with their medications.[19] Many other well-defined adverse patient safety events, such as nosocomial spread of infectious agents, development of resistant organisms, patient falls, etc., have also been documented in the HHC setting.[22-25] As these data are only collected on households receiving Medicare/Medicaid-reimbursed services, the true scope of the problem is unknown.

Implications: This tool, with some minor modifications (based on feedback from the aides who actually used it) can be helpful in identifying household hazards that can place both HHC patients and workers at risk of injury/exposures. The tool is low cost and easy to implement. They surveys were rapidly completed. The patients, based on feedback from aides, were rewarded with the goody bags and the safety items that were included. The next step is to determine the rate and type of remediation that results from a household safety audit and if the remediation results in significant reductions of injuries/exposures in patients (and workers). Interventions studies are required as the next step in this trajectory of safety research.

LIST OF PUBLICATIONS

Gershon, RRM, Pearson JM, Magda LA, Riley HEM, Rosenfeld P. A novel tool to assess safety hazards in the home healthcare setting. The Agency for Healthcare Research and Quality 4th Annual Conference. 2010 September 26-29: Bethesda, MD.

Gershon RRM, Pearson JM, McAlexander TP. A novel tool to address safety hazards in the home healthcare setting. American Public Health Association Annual Meeting & Exposition; 2010 November 5-9: Denver, CO.

Robyn R.M. Gershon, DrPH; Julie M. Pearson, BA; Lori A. Magda, MA; Peri Rosenfeld, PhD. Healthy Housing for Vulnerable Seniors: A New Checklist to Identify Household Hazards. The International Conference on Urban Health; 2010 October 27-29: New York, NY.

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Appendix A
List of Terms and Abbreviations

1. HHC: Home Healthcare
2. PAR: Participatory Action Research
3. SEIU-1199: Service Employee International Union
4. VNS-NY: Visiting Nurse Service of New York
5. IOM: Institute of Medicine
6. HRO: High-reliability organization
7. CHHA: Certified HHC agencies
8. LTHHCP: Long-term HHC programs
9. LHCSA: Licensed HHC services agencies
10. OASIS: Outcomes and Information Set
11. CMS: The Centers for Medicare and Medicaid Services
12. OBQI: Outcomes-Based Quality Improvement

Dr. Robyn RM Gershon, Principal Investigator
Columbia University Mailman School of Public Health

Code: _____

Household Safety Checklist

Today's Date: _____

Did your patient sign the Consent Form: Yes **What time did you start the survey?** _____

A. Information on your patient:

1. Age: _____ 2. Gender (M/F): _____
3. Can your patient walk without help (e.g., a person or thing)? Yes No
4. What is your patient's overall health status (circle): Poor Fair Good Excellent
5. How many people live in the home: _____ Please list them: _____
6. Do you know the medicines (prescription & nonprescription) your patient takes daily? Yes No N/A
7. How does your patient keep track of their medicines now?

   "Pre-poured" or placed in a pillbox (see picture)

   Medicines lined up

   Other method

   No method to keep track

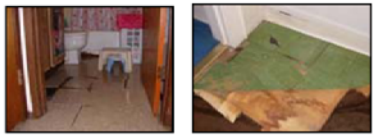
8. Does patient keep any medicine in the home that they are no long taking? Yes No
9. Does the patient use a hearing aid? Yes No

B. Please check if any of these hazardous conditions or safety risks ARE found in your patient's home:

10 Poor lighting

11 Loose or worn-out rugs or carpets

12 Uneven or slippery floors



13 Mold or fungus

14 Dangerous space heater (uses flammables)

15 Dangerous electrical cords (easily tripped over, overloaded outlets, damaged cords)

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Columbia University Mailman School of Public Health

Code: _____

16 Excessive dust or animal hair

17 Awkwardly placed furniture (blocking exit)

18 Excessive Clutter (it might block the exit out)

19 Food not generally stored in a sanitary manner

20 Trash builds up in the home

21 Cleaning products and other potential poisons that are **not** in the original containers (original labels are not in place)

22 Non-food and food items kept in same cabinet

23 Stove knobs hard to reach

24 Flammables (towels, curtains, paper) near stove tops

25 Rotten food or milk in the home

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Code: _____

26 Threat of violence, like aggressive dogs and other pets, neighbors, or weapons

28 Excessively loud noise in the home (from inside or outside the home or apartment)

27 Doors are lacking good lock (e.g., dead bolts, chain lock, peep hole, etc.)

29 Signs of cockroaches in the home

30 Signs of other bugs in the home like bed bugs, fleas, or lice

Bed Bugs:

Bed Bug Bites:

Lice:

Flea Bites:

31 Signs of rats or mice in the home

32 Unsafe use of smoking materials

C. Please check if these safety items ARE NOT found in your patient's home:

33 Carbon monoxide alarm in the home

34 Smoke alarm in the home

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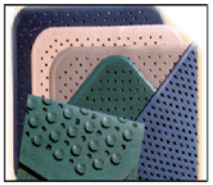
Code: _____

35 Grab bars to get in/out of the shower/bathtub

38 Non-slip shower mat or pads in the shower/bathtub



36 Fire extinguisher in the home

39 Non-slip rug on the bathroom floor next to the shower/bathtub

37 If yes, is the pressure gauge arrow in the green section (i.e., is it working)

40 Emergency contacts list available (e.g., family, doctor, superintendent, etc)

D. Please check if the following safety and medical devices ARE in your patient's home:

41 Safe lifting device
If yes, have you been trained to use it?
Yes No

42 Needles and other sharps
If yes, is there a sharps container?
Yes No

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Code:

43 Oxygen tank If yes, were you trained to use/store/handle it? Yes No 	47 Ventilator If yes, were you trained to assist patient in its use? Yes No 
44 Portable toilet If yes, were you trained to assist patient in its use? Yes No 	48 Nebulizer If yes, were you trained to assist patient in its use? Yes No 
45 Wheelchair If yes, were you trained to assist patient in its use? Yes No  	49 Walker If yes, were you trained to assist patient in its use? Yes No  
46 Cane If yes, were you trained to assist patient in its use? Yes No  	50 Other Please list: _____ If yes, were you trained to assist patient in its use? Yes No

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Code: _____

E. Please answer these few questions about taking this survey.

51. What time did you finish the survey?

    _____

52. Did the training session help you to complete this checklist for your patient?

    Yes / No (Circle one)

53. Was your patient interested in the goody bag?

    Yes / No (Circle one)

54. Did your patient find the fact sheet (resources list) helpful?

    Yes / No (Circle one)

55. How easy was it to use this survey?

    Easy Moderate Difficult (Circle one)

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