

# Household-related Hazardous Conditions With Implications for Patient Safety in the Home Health Care Sector

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**Objectives:** The home health care (HHC) setting is unique because it is both a household and a care-giving environment. As such, it may present a risk for adverse events that could affect the health and safety of HHC patients. This study assessed and characterized unsafe household conditions with implications for patient safety in the HHC setting.

**Methods:** A convenience sample of HHC registered nurses (RNs) from New York State completed a self-administered survey, which addressed the type and frequency of hazardous conditions in the households of their current patients. These nurses were asked to report on potential hazards (biological, chemical, environmental and physical, and violence) observed in patients' households.

**Results:** A total of 738 RNs completed the survey. Hazardous household conditions were frequently reported including animal hair (n = 543, 74%), cigarette smoke (n = 534, 72%), excessive dust (n = 428, 58%), vermin (n = 328, 44%), and unsanitary conditions (n = 317, 43%). The threat of violence was also frequently reported. Hazardous conditions were significantly associated with a number of patient-related factors.

**Conclusions:** Hazardous conditions identified in the households of HHC patients present a well-documented risk of injury/illness in the community setting and may also present occupational risk to caregivers. Many of these hazards are readily modifiable, although others may be less amenable to intervention. Additional studies are warranted in order to further assess and characterize the prevalence and risk factors for hazardous household conditions and to determine the relationship between these conditions and adverse patient safety events in the home care setting.

**Key Words:** home health care, patient safety, household hazards

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Although home health care (HHC) is the fastest growing sector in the health care industry, data are particularly sparse with respect to patient and provider safety in this setting. This is a concern because the increasingly frail and elderly HHC patient population may be especially vulnerable to adverse events. Patients are discharged to home care “sicker and quicker” and with more complex health problems, thus more often requiring a higher acuity of care than ever before. This higher level of care and resultant increased use of medical devices in home care may increase the risk for medical error (eg, medication error) and the potential for harm to patients. Importantly, hazardous household conditions could also potentiate the risk of medical error, as well as directly result in injury or illness in HHC patients. Because the household is also the workplace setting for HHC workers, household hazards might also be occupational hazards for workers. Therefore, unsafe conditions in the household may pose a threat to both patients and workers. They may also present a risk to informal caregivers, such as family members and friends. The article is focused, however, on the potential risk to patients. A definition of terms used in this manuscript is provided in Table 1.

Although efforts to improve safety in health care have dramatically increased since the landmark Institute of Medicine (IOM) report “To Err is Human,”<sup>1</sup> most of the focus has been directed toward hospitalized patients. However ensuring patient safety in the HHC setting might be especially problematic because the household environment may present numerous challenges. These include the lack of direct supervision and oversight of staff, limited safety-related training opportunities for caregivers, and lack of readily available infection control and safety resources routinely found in hospitals, such as cutting-edge safety equipment and supplies. Further, the HHC patient's household is not only a health care delivery setting but also a health care workplace. Standards that regulate safety in health care (eg, OSHA's bloodborne pathogen standard)<sup>2</sup> and help to reduce the risk of harm to workers and, indirectly, to patients as well, either do not apply in the household setting (eg, sharps disposal) or are difficult, if not impossible, to regulate. Well-documented household hazards, such as slips/trips/falls hazards (eg, loose rugs, uneven steps, etc.), violence or the threat of violence, and

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TABLE 1. Definitions of Terms\*

Terms	Definitions
Adverse health effect	Any change in a body function or structure that can lead to disease or health problems (eg, bodily injury, disease, decrease in lifespan, change in mental condition resulting from traumatic exposures and stress, etc.).
Control measures	<i>Engineering controls</i> engineer out the hazard using design specifications, ventilation, etc. <i>Administrative controls</i> include policies, procedures, education, training, housekeeping practices. <i>Personal protective</i> equipment that protects the person from exposure.
Exposure	Contact between an agent and a target (or host).
Hazard	A source of potential damage, harm or adverse effect. Hazards can come from a wide range of sources, including substandard conditions, practices or procedures and include the actions or lack of actions by people.
Hazard categories	Hazards are commonly classified by category, eg, Biological (eg, bacteria, viruses, etc.) Chemical (eg, toxic chemicals, pollutants) Physical (eg, temperature, noise) Psychosocial (eg, violence) Safety, general environmental (eg, slip/trip/falls hazards, equipment malfunctions, etc.)
Health and safety management	Organized system of identifying hazards and reducing the risk of exposure to them. The goal is to achieve and maintain a high standard of safety.
Incident	Unplanned event that results in personal injury or damage to property, equipment or the environment or an event that has the <i>potential</i> to result in these consequences.
Occupational safety	Safety of the workplace
Risk	A measure of the probability of the occurrence of an adverse effect (or event) or the severity of the adverse effects.
Risk assessment	Risk evaluation based on exposure, severity, and probability.
Safety	The control and elimination of recognized hazards to attain an acceptable level of risk pertaining to both the patient and the worker.

\*National Safety Council. Occupational Safety Terms and Concepts. [cited 2008 June 23]; Available from: [http://www.nsc.org/resources/issues/safetyknow/safety\\_terms.aspx](http://www.nsc.org/resources/issues/safetyknow/safety_terms.aspx); Canadian Centre for Occupational Health and Safety. Hazard and Risk. [cited 2008 June 23]; Available from: [http://www.ccohs.ca/oshanswers/hsprograms/hazard\\_risk.html](http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.html); Zartarian VG, Ott WR, Duan N. A quantitative definition of exposure and related concepts. *J Expo Anal Environ Epidemiol.* 1997;7(4):411–37.

airborne exposure to toxic substances, can increase the risk of injury and exposure to HHC patients. To improve our understanding of the household-related hazards that may pose a threat to patient safety, we conducted a hazard assessment survey in the HHC setting.

## HHC Sector

The HHC sector now employs over 1.3 million workers including 1.1 million paraprofessional aides and personal assistants, 115,000 registered nurses (RNs) and roughly 25,000 other professional staff such as physical therapists, occupational therapists, and social workers.<sup>3</sup> Currently, there are nearly 18,000 HHC agencies in the United States providing an estimated 8 million episodes of care per year.<sup>4</sup> This most likely represents only a fraction of the true number of patients in HHC because many are not eligible for Medicare/Medicaid and receive pay-for-service formal care through non-Medicare-certified agencies or from informal caregivers such as family members.

The scope of HHC is broad and covers a very wide range of services, from assistance with daily living activities to more complex care provided to post-surgical or patients with chronic illness. Approximately 44% of services provided are related to personal care, with 37% of patients receiving therapeutic care, most which is physical therapy.<sup>5</sup> Psychosocial care (primarily social support) is provided to 12% of the patients.<sup>5</sup> Most RNs provide multiple types of care. Despite the acuteness of care that is currently being provided in the home setting, the cost of HHC is still significantly less per day than a nursing home or inpatient hospital stay (\$109 vs

\$499 vs \$3838, respectively) and is increasingly favored by patients and families.<sup>4</sup>

Unprecedented demand for home care services is resulting in a rapidly growing workforce; the HHC workforce is now one of the fastest growing in the US labor market. It is estimated that twice as many HHC employees will be needed by 2030 because of the growing elderly population in the United States.<sup>6</sup> This impending imbalance between the supply of workers and demand for care is a serious concern given that the HHC workforce is undergoing demographic age shifts parallel to those in the general population, as well as the fact that the HHC sector already experiences high turnover and labor shortages.

## HHC Patients

The home care patient population is experiencing explosive growth. In 1993, there were 3,688,000 patient discharges (ie, episodes of care); by 2000, this number grew to 7,800,100 discharges.<sup>4,7</sup> If these trends continue, by 2030, there could be as many as 34 million projected discharges.

There is also a rapid growth in the proportion of HHC patients who are elderly, reflecting not only the “graying” of America, but also increased population longevity. Currently, there are more than 37 million Americans over the age of 65, and 69% of HHC patients are 65 years or older.<sup>4,8</sup> By 2050, the number of Americans 65 years and older is expected to increase to 87 million.<sup>9</sup> The number of extremely old Americans is also rapidly increasing; by 2050, 21 million Americans will be 85 years and older, whereas in 2000 that number was only 4.2 million.<sup>9–12</sup>

As noted, patients increasingly enter home care with complex medical problems, requiring multiple interventions and advanced care. On average, each HHC patient has 3 different diagnoses<sup>13</sup>; the most common of these are heart disease (47%), injuries (16%), osteoarthritis (14%), and respiratory ailments (12%).<sup>4</sup> Many types of procedures formerly limited to the inpatient setting are now conducted in home care including dialysis, chemotherapy, tracheostomy care, and infusion therapy.

### Patient Safety in HHC

Quality improvement in HHC is monitored through the uniform patient-level data set, the Outcomes and Information Set (OASIS).<sup>14</sup> Outcomes and Information Set 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 developed a quality initiative, the Outcomes-Based Quality Improvement, which is based upon the OASIS data.<sup>15,16</sup> The Outcomes-Based Quality Improvement 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 3 million HHC patients studied had reports of emergent care related to a fall or accident.<sup>17</sup>

Although 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.<sup>18</sup> The few published studies of HHC quality usually focused on medication errors (all document serious deficiencies).<sup>19–21</sup> For example, Meredith et al<sup>19</sup> found that about one third of elderly HHC patients had potentially serious problems with their medications. Many other well-defined adverse patient safety events, such as nosocomial spread of infectious agents, development of resistant organisms, patient falls, and so on, have also been documented in the HHC setting.<sup>22–25</sup> Although these data are only collected on households receiving Medicare/Medicaid-reimbursed services, the true scope of the problem is unknown.

### Household Hazards

Households can be unsafe environments. Annual estimates of nonfatal accidents occurring in US households range from 9 to 12 million, with roughly 10 million household injury victims seen in emergency departments.<sup>26,27</sup> The cost of these incidents is a staggering \$222 billion a year in medical costs alone, exceeded only by the medical costs related to automobile accidents (\$238 billion in 2001).<sup>26</sup> With respect to household-related deaths, between 20% and 33% (an estimated 18,000 to 33,000 fatalities/year) of all injury deaths in the United States occur in the household.<sup>26,27</sup>

The leading types of injuries experienced in the home are falls, poisoning, and burns.<sup>26</sup> The elderly are especially at risk; each year close to 2 million older adults are injured in the home, and the rate of falls and fatalities due to falls in both the

community and in institutions is greatest in people 70 years and older. For example, people who are 70 years and older have roughly a 4- to 5-fold increase in fatal falls compared with those in their 60s and a 25-fold increase compared with people who are less than 60 years.<sup>28,29</sup> The elderly not only have a high incidence of falling (about a third of elders in the community fall each year) but also a high incidence of serious injuries (eg, brain injuries) related to their falls—even minor falls can result in fracture, laceration, or the need for hospitalization.<sup>28–30</sup>

Not surprisingly, many elderly people are afraid of falling; in 1 report, among community-dwelling elders who had fallen at least once, 50% feared falling again.<sup>31</sup> Falls have been shown to result from a combination of factors, including the victim's health status (60% of home-dwelling elders with a known diagnosis, such as stroke or Parkinson disease, have actually fallen 1 or more times),<sup>32–35</sup> medical treatment (eg, medications, polypharmacy),<sup>36</sup> and environmental factors (eg, loose rugs, improper footwear, poor lighting, uneven or broken steps, missing handrails and grab bars, etc.).<sup>37,38</sup> A metaanalysis of falls prevention programs found that the most effective programs were those that addressed multiple major risk factors including environmental factors.<sup>28</sup>

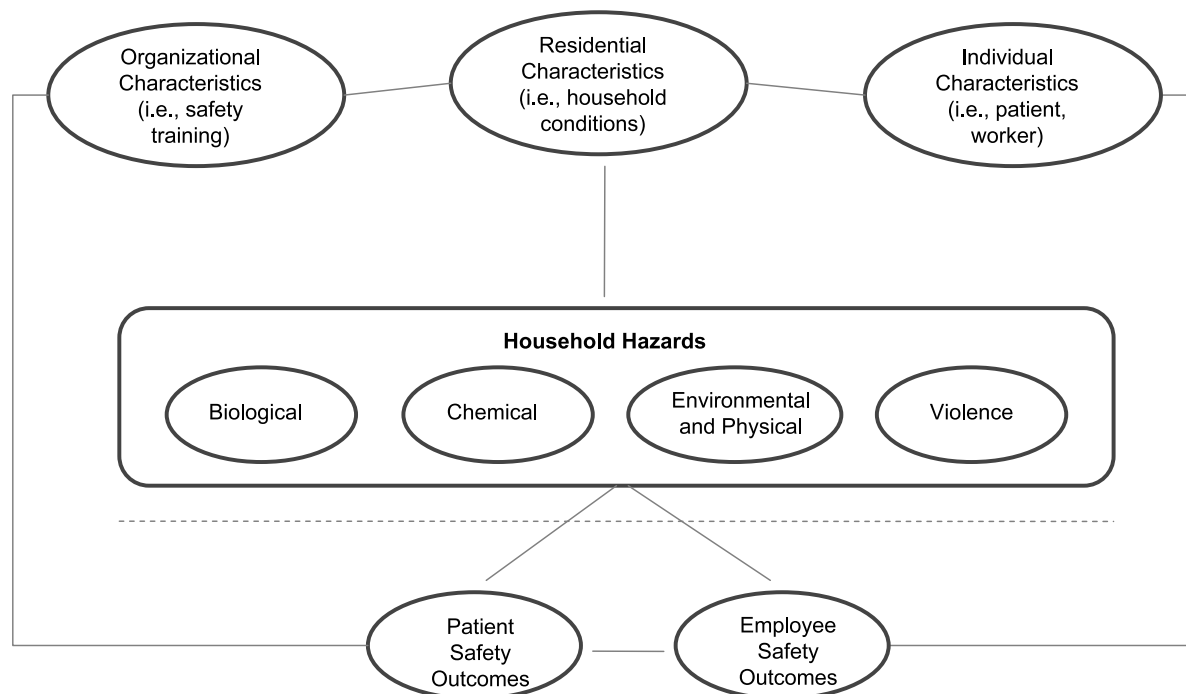
Other types of household hazards identified in the few studies that have examined household safety generally note suboptimal or poor compliance with even the most basic recommendations. For example, in 1 study, the prevalence of carbon monoxide detectors in homes with adults who are 70 years or older was found to be only 28%. Although 97% of all homes reported smoke alarms, only 69% reported having fire extinguishers (a mere 41% of apartment dwellers). Just 35% of households with occupants aged 70 years or older had fire escape plans.<sup>26</sup> Safety researchers have long advocated for improved housing conditions to improve the health and well-being of vulnerable occupants.<sup>39–42</sup>

With respect to household hazard assessment in the HHC setting, anecdotal reports from home care agencies indicate that basic assessments of the household (usually for risk factors for falls) 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. Consequently, our understanding of the role that hazardous conditions play in terms of patient safety is limited. The purpose of this study was to address this knowledge gap by characterizing unsafe household conditions that have the potential to adversely impact HHC patients.

## METHODS

### Survey Design

A new study questionnaire, informed by qualitative data collected during in-depth interviews, focus groups and cognitive interviews, was designed to assess safety hazards related to HHC. The questionnaire was then extensively pilot-tested. The study team also shadowed HHC RNs on patient visits in order to observe and assess household settings to ensure content validity. On the basis of these inputs and guided by an integrated framework that was adapted from a number of



**FIGURE 1.** Health and safety in the HHC household setting.

models that predict safety in the community (or at the individual level) and systems-level safety models adapted for health care workers (Fig. 1), a 96-item study questionnaire with 5 major constructs was developed.<sup>43,44</sup>

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## Measures

1. RN demographic characteristics: age, gender, tenure in home care, number of hours worked per week, number of patients seen per week.
2. Patient-related characteristics: residence dwelling type (house, apartment building, assisted living, group home, senior housing), community setting (urban, suburban, rural), and type and level of care received (short-term, long-term, high-technology/infusion, hospice, maternal/child health, mental health).
3. Organizational characteristics: staffing, safety training, and safety equipment availability.
4. Household hazards: biological, chemical, environmental and physical, and violence.
5. Adverse outcomes in nurses: blood and body fluid exposure history and other types of exposures/injuries.

The household hazards construct was categorized into 4 sub-constructs as follows: “Biohazards,” consisting of 2 items (vermin and unsanitary conditions), “Chemical Hazards,” limited to a single item (irritating chemicals), “Environmental and Physical Hazards,” measured using a checklist of 10 environmental/physical items (eg, air pollutants, noise, clutter, etc.), and “Violence,” consisting of 5 violence-related items including threatening family members, patient’s neighborhood, and patient’s pets. The other violence-related items

included the presence of firearms and illicit drugs in the home. All household hazard items were scored as yes (1) or no (0).

For this study, the analysis was limited to items addressing demographics of the HHC RN, patient-related characteristics, household hazards, and organizational characteristics, such as availability and training on safety devices. The survey was designed to be completed in 20 to 30 minutes and was prepared at a 10th grade reading level to facilitate its rapid completion. Most survey responses were categorical, although some 4- to 5-point Likert-type scale and open-ended items were also included. Although the survey was anonymous, each participant was asked to sign an informed consent form, and all study procedures had the prior approval of the Columbia University Medical Center Institutional Review Board and the collaborating agencies. Copies of the questionnaire, codebook, and psychometric properties of the instrument are available by contacting the corresponding author.

## Survey Distribution

Twenty-six home care agencies located throughout New York State (NYS) were recruited to participate through collaborating organizations including the Home Care Association of NYS, the NYS Health care Providers, and the NYS Nurses Association. From these agencies, a convenience sample of HHC RNs was recruited. Registered nurses could complete the self-administered questionnaire during data collection sessions held at their agency headquarters or they could complete mailed questionnaires. Each study participant was provided with a questionnaire packet, which consisted of a letter of introduction from the principal investigator describing the study, the study questionnaire, a preaddressed, prestamped

return envelope (for mailed surveys) and, as an incentive, two 1-dollar scratch-off lottery tickets.

All completed surveys were double-entered into a database and reviewed to ensure accuracy of data entry. Incomplete questionnaires missing a substantial amount of data were not included in the data analysis.

### Data Analysis

Preliminary data analysis steps included data editing, the collapsing of variables and formation of household hazards sub-constructs. Cronbach  $\alpha$ s were calculated for each of the subconstructs to determine the internal reliability consistency. Descriptive analysis followed, which included the calculation of means, percentages, and SD.  $\chi^2$  Statistics and odds ratios (OR) with their 95% confidence intervals (95% CI), where appropriate, were calculated to determine the association of the household hazards with patient-related characteristics (dwelling type, community setting, type, and level of care).

**TABLE 2.** Description of the Sample, HHC RNs, New York City, 2005 (N = 738)

Characteristics	Number (%) Reporting*
Gender	
Female	701 (95.1%)
Male	36 (4.9%)
Missing	1 (0.1%)
Age	Mean = 49.99 yr; SD $\pm$ 9.58
Tenure as a HHC registered nurse	Mean = 21.63 yr; SD $\pm$ 10.77
Hours worked in home care (per week)	Mean = 32.96 hours; SD $\pm$ 16.04
Clients seen (per week)	Mean = 17.31; SD $\pm$ 12.99
Client residence (dwelling) type	
House only	220 (29.8%)
Apartment building only	103 (14.0%)
Assisted living/ Senior housing/ Nursing home only	15 (2.0%)
House, apartment building and assisted living	109 (14.8%)
Combination of dwelling types	217 (29.4%)
Missing	74 (10.0%)
Client residence setting	
Urban only	294 (39.8%)
Suburban only	193 (26.2%)
Rural only	129 (17.5%)
Any combination of settings	49 (6.6%)
Missing	73 (9.9%)
Level/type of care provided	
Acute only	105 (14.2%)
Chronic only	142 (19.2%)
Acute and chronic only	100 (13.6%)
Acute, chronic, and high-technology/infusion only	49 (6.6%)
High-technology/infusion only	8 (1.1%)
Hospice only	29 (3.9%)
Maternal/child health only	25 (3.4%)
Mental health only	4 (0.5%)
Combination of care types	220 (29.8%)
Missing	56 (7.6%)

**TABLE 3.** Hazardous Conditions in Patients' Household, as Reported by HHC RNs (N = 738)

Hazards	$\alpha^*$	Number (%) Reporting
Biological hazards	0.82	
Vermin (eg, cockroaches, mice/rats)		328 (44.4%)
Unsanitary conditions in the home setting (eg, dirty toilets, poor home hygiene)		317 (43.0%)
Chemical hazards	n/a	
Irritating chemicals (eg, bleach, cleaning agents)		127 (17.2%)
Environmental and physical hazards	0.91	
Animal hair		543 (73.6%)
Cigarette smoke		434 (72.4%)
Excessive dust		428 (58.0%)
Mold/dampness		289 (39.2%)
Messy home/clutter (eg, loose rugs)		262 (35.5%)
Peeling paint		224 (30.4%)
Temperature extremes at client' home		211 (28.6%)
Poor air quality		197 (26.7%)
Poor lighting in the home		155 (21.0%)
Loud/irritating noise in the home setting		55 (7.5%)
Violence-related hazards	0.82	
Threatening neighborhood		284 (38.5%)
Threatening pets		213 (28.9%)
Threatening family members		202 (27.4%)
Drug use in the home		94 (12.7%)
Guns in the home		65 (8.8%)

\* $\alpha$  = Cronbach  $\alpha$  coefficient.

The level of significance was set at  $P < 0.05$ , 2-tailed. Analyses were conducted using SPSS version 16.0.1.<sup>45</sup>

### RESULTS

Data from 738 completed questionnaires were analyzed. Participants were predominantly female, with an average age of 50 years and a range of 22 to 78 years. The majority had worked in home care for most of their nursing careers. Roughly 44% of RNs' patients resided in urban areas, generally in single-family homes or apartments. On average, participants made 17 patient visits per week. Nineteen percent of the RNs reported providing chronic care to their patients, 14% provided acute care, 4% hospice care, and 3% maternal care. The remaining RNs provided a combination of care including high-technology, depending on their patients' needs. Registered nurses' typical duties included educating patients and their family members, supervising home care paraprofessionals, coordinating the patient's care with other caregivers, and direct nursing care (wound care, catheter management, etc.). Data on the demographics of the RNs and characteristics of the patients' residence and level/type of care are presented in Table 2.

### Household Hazards

Household hazards that could pose a threat to the health and safety of patients were frequently reported by the RNs. These hazards are presented in Table 3. The most prevalent of these were environmental and physical hazards including

animal hair (74%), cigarette smoke (72%), excessive dust (58%), and mold/dampness (39%). Unsanitary household conditions, which could increase the risk of infectious disease, were also noted. These included evidence of vermin (predominantly rodents, cockroaches, and bedbugs) and generally poor housekeeping with unclean bathrooms, kitchens, refrigerators, and sinks most frequently reported. Peeling paint was noted in patient households by 30% of the participants, possibly presenting a risk of lead exposure. Nearly one third of the RNs reported temperature extremes in the households. Household hazards that could increase the risk of patient falls, such as piles of clutter, poor or substandard flooring, and loose rugs were commonly reported. Insufficient lighting, a known risk factor for falls, was also noted by 1 out of 5 nurses.

Reports of violence-related hazards in patients' households were common. Registered nurses reported "feeling threatened" by the patient's neighborhood (39%), followed by patient's pets (29%) and family members (27%). Illicit drug use in the home was reported by 13% of RNs, and nearly 9% reported the presence of firearms in the home. Almost two thirds of RNs (63%) reported that they could refuse a case for a specific reason and nearly half (48%) of those with this option actually had refused 1 or more cases in their present job.

Organizational characteristics that could increase the risk of adverse events in the HHC setting included reports of understaffing (37%) and a lack of safety equipment and supplies. Few RNs reported that they were provided with sharps containers (14%), safety needles and syringes (9%), safety butterfly needles (23%), or safety lancets (26%). However, 91% reported receiving infection control training by their current employer. Although only 21% of the nurses reported that falls prevention safety devices, such as Hoyer lifts, were available to them, a sizeable proportion (40%) reported receiving training on slips/trips/falls prevention. Although all medications and medical supplies are routinely provided as part of health care in a facility, in home care, the patient may have the responsibility for purchasing basic supplies. Roughly 14% of RNs said that the patient care equipment, including safety equipment, was provided by the patients.

### Correlates of Household Hazards

To determine the relationship between residence type, community setting, and type of care provided with each of the household hazards subconstructs, bivariate analyses were conducted using either the  $\chi^2$  statistic (for tables larger than  $2 \times 2$ ) or the OR (for tables that were  $2 \times 2$ ). The presence of biohazardous conditions was more likely to be reported by RNs for households located in apartment dwellings than in private homes (OR, 2.15; 95% CI, 1.27–3.63). Similarly, chemical hazards (OR, 1.97; 95% CI, 1.07–3.63) were also more likely to be associated with apartments compared with private residences. As reported by nurses, households where patients received high-technology care (whether acute or chronic) as opposed to non-high-technology care were more likely to have environmental and physical hazardous conditions present ( $\chi^2$  statistic=12.24,  $P = 0.007$ ). Environmental and physical hazards were also more likely to be associated with households located in urban communities compared with

other types of communities (OR, 3.14; 95% CI, 1.88–5.26). Biohazards were also significantly associated with urban dwellings ( $\chi^2 = 15.02$ ,  $P < 0.001$ ) as opposed to household located in suburban or rural communities, although chemical hazards (irritating chemicals) were not associated with community setting.

With respect to violence-related hazards, data indicate that these were more likely to be associated with households located in urban communities ( $\chi^2 = 8.01$ ,  $P = 0.018$ ) compared with suburban or rural communities, and in group home/shelter types of dwellings ( $\chi^2 = 7.91$ ,  $P = 0.02$ ) compared with apartments or private homes. Households where patients received chronic care were also more than twice as likely to be associated with violence-related hazards (OR, 2.22; 95% CI, 1.30–3.79) compared with households where patients received acute care. Households where the patients received high-technology care were also significantly associated with violence-related hazards ( $\chi^2 = 10.70$ ,  $P = 0.013$ ) in comparison to households where patients received other types of care.

### DISCUSSION

These data provide a snapshot of potential hazards to HHC patients, as noted by RNs. Although RNs are not specifically trained to conduct household safety surveys, they were nonetheless able to identify a number of well-characterized hazards that could potentially present a risk of injury and illness to HHC patients. A good example of this was the observation of temperature extremes by nearly 30% of RNs in this study. In 1995, a Chicago heat wave led to 692 excess deaths, mainly in elderly residents.<sup>46</sup> Lack of adequate ventilation or cooling could pose a similar threat to home care patients. Another important finding was the observation of unsanitary conditions in the household. This is a concern given the vulnerability of many HHC patients and the growing threat of community spread of resistant organisms.<sup>47</sup> In addition, although a very high percentage (91%) of RNs reported receiving infection control training, lack of basic safety equipment, such as sharp containers, could present a risk of exposure to not only caregivers but also to other household members. More than a third of the households had evidence of hazards that could increase the risk of patient falls, such as excessive clutter, poor lighting, and lack of safe patient lifting devices. Many of these (eg, clutter) could also present fire hazards, especially in light of the fact that smoking in the household was reported by nearly three quarters of the nurses.

Threats of violence were common including the threat posed by aggressive pets. In focus groups, RNs noted that pets sometimes attacked them when they were treating their patients, which could result in harm to both the worker and their patients. In this study, nearly 30% of the RNs reported feeling threatened by patient's pets and a similar proportion reported threats from family members. Although the nature and context of the threats from family cannot be ascertained by these data, it seems that this might potentially pose some risk to the patients in those households. The presence of firearms and illegal drugs in the patients' homes present clear danger. Such hazards could compromise the actual care giving,

although their impact on the delivery of care is not presently known. Kendra et al<sup>48</sup> explored the effect threats to personal safety might have on care provided to home care patients. They found that 68% of the HHC staff in their study felt unsafe in a home and they would shorten their patient visit. These individuals also reported that they completed their visits “as soon as possible.” Kendra et al suggested that when visits were completed “as soon as possible” some patient care responsibilities might be neglected. Many of the hazards identified in this present study could not only present a risk of potential harm to patients, nurses, and other household occupants, but also might lead to compromised patient care.

The bivariate analyses identified several significant associations. Certain types of hazardous conditions appear to be more closely associated with households located in urban communities; for example, reports of violence, biohazards, and environmental and physical hazards were more common in urban households. Apartment-type dwellings, which are much more prevalent in urban communities, were more likely to be associated with biohazards, although not with environmental hazards or violence. Somewhat surprisingly, households where patients received high-technology care were generally more hazardous than households with patients receiving non-high-technology care. Another unexpected finding was that group homes and shelters were more likely to be associated with violence than other dwelling types. This is surprising because it would seem that these settings would be more likely to have greater security measures in place.

Some of the household hazards identified here might be remedied with relatively simple interventions; in our focus groups, many of the HHC workers reported that they relied on hand gels and creams to cleanse between patients because of the unsanitary conditions of patients' sinks. Aggressive pets might be best managed by simply having them secured before the worker's arrival. However, many other hazards (eg, presence of mice and other vermin) might be difficult to address, as they generally require the assistance of building managers, contractors, or other outside assistance to remedy. Remediation of other hazards, such as cleaning up excessive clutter, are well outside the scope of work for the RNs. However, because RNs frequently provide patient/family education, they could similarly provide information on achieving and maintaining a clean and safe household. However, certain household conditions (eg, lack of security) are outside the direct purview of the caregiver. To what extent the HHC agencies have responsibilities (eg, in terms of reporting unsafe conditions such as presence of illicit drugs) in this matter remains undetermined.

A number of study limitations are noted. First, this study was conducted using a cross-sectional design, and as such, causality cannot be ascertained. Second, because the study team did not collect data on patient injuries and illnesses, the impact of these hazardous conditions on patient outcomes cannot be determined from this study. Clearly, however, many of the risk factors reported here are known to be causally related to adverse events, such as falls. Third, the sample was not randomly chosen; a convenience sample of participants was recruited, and therefore response rates could not be calculated. This sampling strategy was chosen to address the

well-recognized challenges in sampling HHC employees, but it can potentially lead to a number of sampling biases. Thus, while the findings may be generalizable to home care households in terms of community setting, type of dwelling, and the types of care patients receive in New York State, they may not be truly representative of home care households in other parts of the country. Our sample predominantly reported on urban households, other parts of the country that are more rural may have very different hazard profiles. Fourth, the questionnaire addressed household-related hazards and did not include items on well-recognized threats to patient safety, such as medical devices, medications, lack of education of patients and informal caregivers, and so on. Additional study to ascertain the independent and joint effects of all of these potential hazards is warranted. Finally, the questionnaire was confidential, but not anonymous, and therefore RNs may have provided socially desirable responses, perhaps leading to underestimation of certain hazardous conditions (eg, firearms in the home). Despite these limitations, and in light of the paucity of information on this issue, this study does provide new insight into the type and frequency of household conditions that could affect HHC patients. This information might therefore serve to inform future studies with more robust designs.

## CONCLUSIONS

As patients continue to enter HHC at increasing rates and with greater vulnerabilities, it is important to identify potential threats to their safety and well-being. Based on these findings, household hazards should be considered as a possible source of threat to both patients and workers. Surveillance measures and risk-reduction interventions may be needed, but the necessary next step will be determining the magnitude and significance of household hazards in the HHC sector. Going forward, home care providers will be reimbursed at a rate corresponding to their quality outcomes (ie, Pay for Performance)<sup>49</sup>—this makes identifying areas for improvement critical for the industry's financial survival. Although patients overwhelmingly prefer to receive their health services at home, the safety of that “individualized health care setting” may be questionable and may even be a deterrent to improved health outcomes. Further studies are needed to identify and quantify the impact of, and correlation between, unsafe household conditions on both patients and caregivers in the home across a range of community types and regions to identify best practice interventions that may reduce risk for all involved parties.

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