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Safety Risks Among Home Infusion Nurses and Other Home Health Care Providers

Pia Markkanen, ScD • Catherine Galligan, MSc • Margaret Quinn, ScD, CIH

ABSTRACT

In the United States, home health care (HHC) is a rapidly growing industry and home infusion therapy is a rapidly growing market. HHC can present substantial occupational safety and health (OSH) risks. This article summarizes major OSH risks relevant to home infusion therapy by illustrating them through real-life scenarios collected systematically using qualitative research methods by the National Institute for Occupational Safety and Health-funded research projects at the University of Massachusetts Lowell. The need for home infusion therapy will continue to grow in the future, and safety interventions to prevent or minimize OSH risks are essential.

Key words: case scenarios, home health care, home infusion therapy, occupational safety and health, qualitative methods, safety interventions

The population in the United States is aging rapidly, driving the need for home health care (HHC), including home infusion therapies. In the home, infusion therapy may be provided by HHC nurses who also deliver other types of clinical care to an HHC recipient or by specialized home infusion therapy services that are supported by home health nurses and aides. All of these HHC providers experience similar conditions in the home work environment, which can be very rewarding but may also present safety and health risks.

Infusion therapy treatments frequently provided in the home include antibiotics or antivirals, hematologics, blood products, chemotherapy, parenteral nutrition, rehydration, pain management, and intravenous (IV) steroids.[1,2] In 2008, about 1.24 million infusion therapies were administered to an estimated 829 000 individual patients in National Home Infusion Association member provider locations.[3] According to Webb and Lee,[4] the home infusion therapy market grew from a $1 billion business in 1991 to more than a $16 billion industry in 2010. Harris Williams & Co.[5] conducted a home infusion industry overview in 2014 and reported an estimated 90% cost savings for home and alternative-site infusion therapy services compared with the equivalent infusion care in institutional settings. Martel[1] described how the demand of home infusion therapy has increased workload and time pressures: Clinicians

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All studies reported in this article have been funded by the National Institute for Occupational Safety and Health of the Centers for Disease Control and Prevention (grant R01OH008229). The content is solely the responsibility of the authors and does not necessarily represent the official views of the Centers for Disease Control and Prevention. The corresponding author of this article presented this topic in an educational session for the One-Day Program at the National Academy of Infusion Therapy of the Infusion Nurses Society in Dallas, Texas, on November 6, 2015.

The authors of the article have no conflicts of interest to disclose.

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DOI: 10.1097/NAN.0000000000000227

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are now expected to master a rapidly expanding set of demanding hands-on skills and to educate other caregivers and patients.

For all types of home-based caregivers, the home work environment is both dynamic and unpredictable. In contrast, patients in acute care settings are usually in a standardized environment (eg, in a room or bed) where conditions are familiar to the nurse and where, when something unexpected happens, the nurse can call for backup assistance.[6] Several studies and US government reports have documented the occupational safety and health (OSH) challenges of HHC work.[7-27] OSH hazards in HHC include but are not limited to bloodborne pathogen (BBP) exposures, demanding patient mobilization and transfer tasks, threat of violence and other personal safety issues, exposure to secondhand tobacco smoke and cleaning and other household chemicals, long-distance driving, and the presence of pets. Some of these hazards are present in any health care setting, but the work in isolation in variable and unpredictable home environments can increase home-based caregivers' vulnerability. Some recently developed HHC training curricula now include modules on OSH[28,29]; however, research is still needed to identify feasible public health interventions to protect HHC providers and patients alike.

OBJECTIVES

The objectives of this article are to summarize the major OSH risks in HHC, in particular those relevant to home infusion therapy, and to illustrate them through real-life scenarios. The scenarios derive from a systematic analysis of focus groups and interviews of home health nurses and other caregivers with similar working conditions.

METHODS

This article presents 10 scenarios describing the main OSH findings from 2 different research studies at the University of Massachusetts Lowell: (1) Project SHARRP (Safe Home Care and Risk Reduction for Providers), an examination of BBP exposures among HHC nurses and other clinicians in Massachusetts (2004-2009)[17,24,30,31]; and (2) the Safe Home Care Project (2010-2014), which evaluated risk factors for sharps injuries in HHC, as well as a wide range of other OSH hazards and promising prevention practices among home care aides.[16,18,26,27] Both projects comprised 3 research phases: presurvey qualitative phase, cross-sectional survey, and postsurvey qualitative phase to interpret survey findings and recommend interventions. Detailed methods of the studies are reported elsewhere.[16-19,24,26,27,30-34]

This article is based on data from the pre- and postsurvey qualitative methods phases of both projects, which involved a total of 29 focus groups of frontline HHC providers and in-depth interviews with a total of 35 HHC agency managers, industry trade association directors, and labor union representatives. Out of all 29 focus groups, 8 focus groups involved home health nurses and aides who performed or supported home infusion therapies, in addition to other HHC duties. The audio of all focus group and interview sessions was recorded and transcribed. A computer-assisted thematic analysis was used as the data analysis method. Transcripts were coded with NVivo qualitative research software (NVivo; QSR International [Americas], Burlington, MA) to obtain 3- to 4-level hierarchical coding of themes.

This article also presents previously unpublished qualitative data findings from the Project SHARRP cross-sectional survey; the quantitative analysis of the SHARRP survey has been published elsewhere.[24,30] The survey included open-ended questions to accompany quantitative reports on injuries experienced from sharp medical devices (ie, sharps injuries). These qualitative open-ended narratives of the survey were also coded with NVivo to identify hierarchical themes.

RESULTS

Ten scenarios were identified that illustrate important OSH risks frequently identified in the focus groups and interviews, including BBP exposure hazards; working in isolation; uncontrolled home environmental conditions related to housekeeping and hygiene; inadequate workstations or technology; unpredictable disruptions by family members or pets; and lack of assistive devices, in particular, for patient mobilization and transfer tasks. Seven scenarios focus on BBP exposures and hazards reported by home health nurses in focus groups and interviews. Three scenarios relate to other hazards: violence, risk of musculoskeletal strain and injury related to demanding patient mobilization and transfer tasks, and patient cigarette smoking during oxygen use reported by a home health nurse as well as 3 home care aides.

BBP Exposures

Project SHARRP identified multiple risk factors for occupational sharps injuries in HHC. Figure 1 illustrates themes collected from the open-ended answers of the Project SHARRP survey that accompanied quantitative reports of sharps injuries. Concentric rings in different shades represent thematic levels identified and coded using NVivo software. Focus groups and in-depth interviews of the Project SHARRP study supported these survey findings. The most coded sharps injury themes included (1) sharps disposal factors (eg, clinician's overfilled sharps containers, used sharps left around the home by clients); (2) patient characteristics (eg, patient moves suddenly, uncooperative/mentally unstable patient); (3) home work environment and work organization factors (eg, distractions and clutter); (4) specific medical procedures and other activities (eg, vascular access); (5) worker characteristics (eg, time pressures); and (6) sharps device characteristics (eg, lack of safety features in medical sharps).

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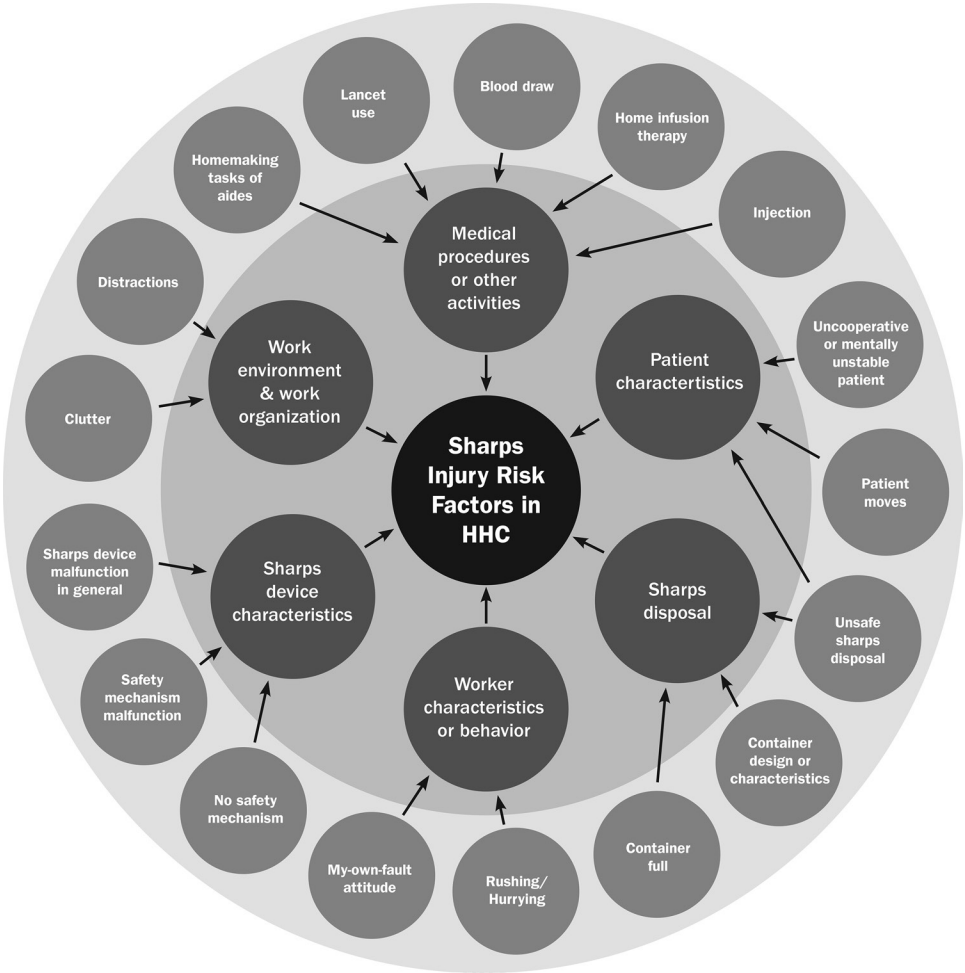

Figure 1 Sharps injury risk factors in HHC reported in the open-ended answers of the Project SHARRP survey. Concentric rings in different shades represent thematic levels identified and coded using NVivo software. *Abbreviation: HHC, home health care.*

Scenario 1: A Seriously Cluttered Home Presenting a Hazardous Work Space to Provide Home Infusion Therapy

A home health nurse needed to place a peripherally inserted central catheter (PICC) in the patient's arm to administer antibiotic medication. The patient's home was very cluttered. There was no table to use, and garbage had piled up. The nurse's first task was to replace a dressing on the patient's leg. At the same time, she needed to decide whether to insert the PICC in these conditions. After about an hour, having finished the dressing and asking for information, she determined the situation was not safe for inserting the PICC; however, the patient needed the antibiotic medication. The nurse asked the patient about options. The patient indicated that the kitchen sink was the cleanest place in the house. The nurse completed the task successfully and safely; however, she had to make a difficult decision, and the situation could have turned out quite differently. She described:

> *It took me about a half hour to be creative, create a safe little space, a space to dispose of my sharps immediately, and how I would do it to insert that PICC. And I used his kitchen sink, of course, and made sure it was safe, but I was very angry that the hospital sent him home knowing that he was going home to that situation when they could [have done it safely in hospital].*
>
> —Project SHARRP focus group participant

Scenario 2: Technology, Patient Characteristics, and Distractions

A debilitated multiple sclerosis patient had been recently discharged with an IV catheter in place. Soon after, a home health nurse visited the patient to start an infusion and noticed the catheter was not functioning properly. The patient did not want to go back to the hospital. The nurse tried to insert a catheter several times unsuccessfully. Both the nurse and the patient got frustrated. The nurse said, "I'm done." The patient became agitated and said, "Please, please, please don't go." Then the nurse was stuck with the used needle. She said:

> *I have no idea what happened, but I was stuck with a dirty needle. I just can't remember because during that time you're so frustrated of not being able to complete your job and with her saying, 'Please, I don't*

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want to go to the hospital,' and I think I was trying to, I pulled the dirty needle out and then I rest [sic] it on something, picked it back up, forget [sic] that it wasn't retracted, and then I got stuck at some point, and I can't remember the details.

—Project SHARRP focus group participant

Scenario 3: A Sharps Injury Near-miss

A home health nurse was removing a patient's noncoring needle, which did not have a safety feature. The patient didn't want to lie down. The patient also didn't want to take off her shirt and had it pulled over to the side. The work space available to the nurse was so restricted that the nurse had to perform the procedure closer to the patient than she judged to be as safe as possible. She pulled the needle out effectively; however, she experienced a rebound from the device, and the needle punctured the side of her glove, fortunately missing her finger.

You just feel the snag on the glove and it was like, Oh, man, that was too close for comfort there. I shouldn't have done that. I should have had her pull that sleeve down more. I should have maybe had her in a recliner or lying down so that she wasn't sitting up in the chair where you tend to move a little bit. And I, myself, probably was not in the best position as I could have been in.

—Project SHARRP in-depth interview participant

Scenarios 4 to 6: Dangerous Distractions During a Medical Procedure

The following 3 scenarios were described by 3 different infusion nurses in the same focus group. In the first case, scenario 4, a nurse had an infusion patient with 2 small children. The patient did not feel it was necessary for the children to leave the room. In the middle of the procedure, the nurse had a sippy cup thrown at her head. The patient told the nurse not to worry about the child. The nurse was not able to place the IV catheter. He said:

I was really nervous by the end and could have had an accident … she [the patient] didn't get the line in, the kids were just off the wall. But I would agree that physical environment of the situation and people in the environment [can distract a medical procedure] so if you can clear the room.…

—Project SHARRP focus group participant

In scenario 5, a home infusion nurse explains how she experienced a patient's family member passing out during a medical procedure:

I've started an IV or done a venipuncture on somebody, and they're fine. But the person sitting in the chair passes out. Now, I have this patient and I have the husband on the floor, you know? If I had made him go to the living room and not watch me he wouldn't have been on the floor. So, I learned the hard way: Clear the room.

—Project SHARRP focus group participant

Patients' pets can be unpredictable. In scenario 6, a home health nurse described her experience as follows:

I've had parrots fly and land on my head. They have claws. They hurt. Land on my head, walk right down my arm as I have my needle in the guy's vein drawing his blood for his insurance. And parrots hurt. I'm not afraid of them. I have parrots myself, but I know what danger they can do. So, clear the room, lock up the animals, lock up the kids.

—Project SHARRP focus group participant

Scenario 7: When a Patient Moves Suddenly

A home health nurse was drawing blood from an elderly patient with dementia with the tourniquet in place. Toward the end, she removed the tourniquet, which fell to the floor. At the same moment the nurse was pulling the needle out, the patient bent down to grab the tourniquet and bumped the nurse's hand. The nurse was stuck with the dirty needle. She reported:

I was drawing blood from an elderly woman and I was using a butterfly needle. She had some dementia and, of course, you're in their home so you don't have the lab table where you can have their arm, you know. She had her arm out, and I got the tourniquet on and I was drawing her blood, and I went to remove the tourniquet before I pulled the needle, you know, before it was quite done, and she saw the tourniquet start to fall. And just as I was pulling out the needle she grabbed that and bumped my hand, so the needle went into my finger. Of course, I had to report it and go through the whole, you have to go through testing [sic]. Even though she was 86, you still have to go through the whole reporting and testing. It was all fine, but it really scared me.

—Project SHARRP focus group participant

Other Hazards

Scenario 8: A Challenging Neighborhood and Threat of Violence

A nurse visited a patient discharged from the hospital after having a bowel resection following a serious bicycle accident. In the home, there was no electricity, heat, or hot water. The nurse understood immediately that the patient had financial problems and arranged for the social worker to meet her there. The social worker and nurse discussed

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the care plan and completed paperwork and other tasks. The nurse described the situation as follows:

> *She [the social worker] encouraged me that I needed to leave now, and we left the home and found 7 cruisers around our cars and a man lying face down on the sidewalk with blood coming from his head, handcuffed with a policeman standing on his back, and a paddy wagon. And then I never went back there without an escort. I was naive, I didn't realize it was a bad section of town. I knew their living conditions were bad but after the fact I realized what a dangerous situation it was. And now I recognize the areas that you need an escort, and my manager was very helpful and actually covisited with me until the situation improved.*
>
> —Project SHARRP focus group participant

Scenario 9: Demanding Patient Mobilization Tasks

The focus group participants and in-depth interviewees of the Safe Home Care Project frequently cited OSH risks resulting in musculoskeletal disorders (MSDs), particularly back pain, back injuries, and shoulder injuries. Key MSD risk factors include manual client mobilization and transfer tasks, which become more dangerous when clients are overweight and/or when no assistive devices are available to mechanize the mobilization and transfer tasks. A home health aide described her case in a focus group:

> *She [the client] was like 400 pounds.... And I was the only one that was [caring for] the lady. And she had a Hoyer lift. So, I had to go in the morning, put her in the Hoyer lift, wash her, give her breakfast—everything by myself. And I wanted to be too good, and I never complained. By the time I complained 3 months after, my back was destroyed.... I should have said something sooner. For me to be so good, I ended up with a very bad back ... my back is [still] not the same.... I still have to take pills. My back is bad.*
>
> —Safe Home Care Project focus group participant

Scenario 10: Home Patients on Oxygen Therapy and Continued Smoking Habits

Perhaps the most surprising finding of the Safe Home Care Project's qualitative phase was that aides described clients who continued to smoke cigarettes while receiving home oxygen therapy. Six of 12 focus groups that were conducted during the Safe Home Care Project's presurvey qualitative phase brought up the problem of patients smoking while receiving home oxygen therapy. Below are examples from 3 different focus group reports by home care aides that illustrate this scenario[34]:

> *... the people ... are using the oxygen and they smoke in the house.... It's happened sometimes, it's happened. Even when they know they're not supposed to do it. Even when you report it, they still do it, and there's nothing you can do about it..... You can refuse to go into the house.... We can say, I'm not going there because you are smoking and you have the oxygen, but some people they don't care.*
>
> —Aide 1. Safe Home Care Project focus group participant

> *I have a client that is on oxygen and she smokes while she has it on. She doesn't want to stop, she has had social workers, nurses, everybody you can think of going in there to tell her to stop. I actually see sparks on her nose. So now when I go in, I just tell her, you can't smoke. Some days I'm there an hour and a half, some days 2 hours. So, she has to go 2 hours without smoking a cigarette ... she was outside, she drove a scooter, and she had her oxygen on her face, and she saw a neighbor and she took her oxygen off her face to smoke the cigarette, and the neighbor said to her: You don't need to take that off your face. She said yes I do, and she said no you don't, you can smoke with it on. So, she's been smoking with it on ever since.*
>
> —Aide 2. Safe Home Care Project focus group participant

DISCUSSION

BBP Exposures

Figure 1 and scenarios 1 to 7 illustrate BBP exposure risk factors that were reported by home health nurses. The Project SHARRP survey, following the focus groups and interviews where these scenarios were identified, found that approximately 35% of nurses had experienced at least 1 injury with a previously used sharp during their HHC career.[24] The annual sharps injury incidence rate for home health nurses was 5.1 per 100 full-time equivalent nurses.[24] The rate was consistent with the literature findings in hospitals and nonhospital facilities.[11,12,35] Two hundred seventy-five nurses who reported sharps injuries in the SHARRP survey were engaged in the following medical procedures either during or immediately before the sharps injury: injections (31%), fingersticks or heelsticks (23%), blood draws (22%), and using an IV catheter (8%).[24] HHC clinicians are covered by the Occupational Safety and Health Administration's BBPs standard,[36] which requires the use of engineering and work practice controls to eliminate or minimize BBP exposures among employees. Engineering controls include sharps with injury prevention features (SIPFs). However, the SHARRP survey found that SIPFs were not frequently used in home care, in particular when the sharps were procured and used by patients (eg, lancets or insulin syringes).[24] In addition to a lack of SIPFs, a follow-up qualitative study identified the reuse of sharps and challenges in sharps disposal practices among home users.[16]

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Back Injuries and Other MSDs

Workers' compensation records indicate that back pain/injuries and other MSDs are the most reported and costly incidents in HHC.[18] The biggest risk factor is patient/client mobilization and transfer tasks, which become more demanding when patients have limited or no mobility or when they are overweight as described in scenario 9. Also, caregivers who perform homemaking duties (ie, cleaning, laundry, and grocery shopping) reported musculoskeletal strain.[18] Among the 1249 home care aides who completed the Safe Home Care survey, more than 10% experienced some type of work-related injury serious enough for the aide to seek medical care and/or lose work time in the 12 months before the survey.[27] Of these, the most common was a musculoskeletal injury related to client handling, followed by slips, trips, or falls outside the home (eg, falling on icy stairs, snowy walkways). About one-third of all aides experienced back pain in the previous 12 months; three-quarters of this group considered the pain to be somehow related to their work.[27] The physical home space limits the use of high-tech devices to the same or greater extent as in hospitals and skilled nursing facilities. However, low-tech devices can improve both caregiver and patient safety (eg, grab bars, shower chair/bench, adjustable bed).

Other Safety Risks

Scenario 8 illustrates a situation in which the threat of violence is imminent during a home health nurse's visit. All home health nurse participants in Project SHARRP's focus groups were concerned about the threat of violence (either physical or verbal) in a patient's neighborhood or inside a patient's home. In the Project SHARRP survey, 11% of 275 nurses reported that an aggressive or uncooperative patient was a contributing factor to a sharps injury.[24] In the Safe Home Care survey, approximately 7% of the 1249 home care aides reported experiencing physical violence, while nearly 20% experienced verbal violence in the 12 months preceding the survey.[27]

Medical oxygen combined with smoking or other sources of ignition is a serious fire and explosion hazard that threatens not only workers who visit homes but also community members (scenario 10).[34] Home cooking equipment, smoking materials, and heating equipment are leading causes of residential structure fires, injuries, and civilian home fire deaths.[37] The Safe Home Care survey results reinforced focus group findings. Medical oxygen was present in 9% of aide visits (314 of aides' 3484 recent client visits), and 25% of clients on oxygen therapy were described as smokers.[34] Other HHC hazards that may not be visible in workers' compensation records but were cited by aides and their supervisors include bed bugs, infectious diseases, indoor air quality concerns (eg, secondhand smoking and the use of harsh cleaning chemicals), clutter/hoarding, and clients' pets.[18]

Interventions for HHC Workers and Patient Safety

Table 1 summarizes occupational hazards identified in scenarios 1 to 10, as well as interventions that both HHC managers and nurses could undertake to improve safety.

The Joint Commission and other sources have shown that health care worker safety is closely linked to patient safety in all care settings and that a strong business case can be made for safety.[38-40] Discharge planning is critical in determining whether the patient's home environment is appropriate for a required medical procedure or technology. Boling emphasized that "transitions of care are hazardous times with much at stake"[41(p146)] and that care transitions should account for the needs of the patient, the family, and the providers across all care settings.

In the Safe Home Care Project interviews, HHC agency supervisors reported on essential interventions. A baseline assessment is critically important for both HHC clinician and patient safety. An initial evaluation is carried out by a case manager or other authorized clinician before a new patient/client is accepted as a new case.[18] This evaluation informs development of a care plan. At the same time, it is an opportunity to recommend specific safety interventions (eg, implementing assistive devices or home environment modifications). During the first assessment, application of a household safety checklist, such as the one developed by Gershon et al,[9] would be beneficial to ensure that caregiver safety aspects have been taken into consideration.

Agency managers value teaching safety at new employee orientations and believe these programs have had a major role in curtailing sharps injuries among employees.[18] Regular continuing education and in-service training have been reported as important opportunities for teaching safe work practices, including protections from BBP exposures, personal safety, back safety, and care for clients with dementia. Table 2 lists selected assessment checklists and training tools developed specifically for HHC.

CONCLUSION

The need for home infusion therapy will continue to grow in the future and warrants thoughtful consideration regarding safe delivery of medical care in the home environment. Home health nurses and other home-based caregivers experience substantial OSH hazards, many similar to those faced by clinicians in institutional settings. HHC clinicians also experience hazards unique to the home workplace. Preventive OSH interventions developed for hospitals and skilled nursing facilities can serve as models for HHC, but may require adaptations for home conditions. Entirely new solutions designed for the unique delivery of care at home are also needed. When safety interventions are implemented and evaluated, the positive HHC job dimensions—such as job autonomy, flexibility, and the ability to develop caring relationships—can and must be preserved.

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TABLE 1

Occupational Hazards Identified in Case Scenarios 1 to 10 and Suggested Safety Interventions That Can Be Implemented by HHC Managers and Nurses[a]

Occupational Hazards/Contributing Factors to Injuries and Exposures	Agency-Level Interventions: HHC Managers	Work Practice Interventions in the Home: HHC Nurses

Patient characteristics related to
• Sharps injury hazard
  ○ Moves suddenly during a sharps procedure
  ○ Noncooperation/aggression
• Musculoskeletal strain hazard
  ○ Limited mobility/overweight
• Fire hazard
  ○ Smoking while on oxygen
Home environment
• Clutter/hoarding, pets, distractions during patient care procedures
Community/neighborhood
• Threat of violence
Work practice
• Limited work space, work in isolation without immediate backup, awkward work postures, sharps without safety features
	Discharge
	• HHC manager participates in discharge planning and accounts for safety of HHC nurse as well as patient.
	HHC agency intake: patient evaluation in the home
	• Recommend and initiate home environment modifications for improved safety; develop a care plan considering both the caregiver and patient safety; and educate the patient/family to prepare the home for an HHC visit.
	Employee training
	• Include OSH training in new employee orientations, continuing education sessions for nurses, and in-service training sessions for home care aides using real-life scenarios.
	Agency safety policies
	• Develop, implement, and annually review agency policies for BBP exposure control plan, safe patient mobilization/handling practices, violence prevention, pet safety, and oxygen therapy safety. Agency hazard surveillance and injury reporting systems.
	  ○ Establish reporting systems and use positive incentives to encourage employees to report hazards and injuries.
	  ○ Use the systems to identify and solve problems and to identify good practices.
		Preparation
		• Set up a safe and clean work area for sharps procedures in accordance with the BBP exposure control plan and clear from distractions.
		• Use standard precautions.
		During patient care/clinical procedure
		• Be prepared for the patient moving suddenly.
		  ○ When a needle is in the patient, keep your hand on the device in the event the patient flinches.
		• Ensure safe work postures.
		  ○ For infusion therapy or phlebotomy, set the patient in a position you are comfortable with.
		  ○ Recline heavy patients before sharps insertion.
		Communication
		• Continue patient and family education on safe HHC practices.
		• Report a hazardous situation/incident or injury to the HHC agency management.

Abbreviations: BBP, bloodborne pathogen; HHC, home health care; OSH, occupational safety and health; SHARRP, safe home care and risk reduction for providers.
[a]Derived from focus group and interview findings of Project SHARRP and the Safe Home Care Project.[16-18,24,26,27,30,31]

TABLE 2

Selected OSH Assessment and Training Tools for HHC

Source	Content
Household safety checklist by Dr. Gershon[a]	A checklist illustrating 50 items to assess hazardous conditions and safety risks in the home
NIOSH Hazard Review: Occupational Hazards in Home Healthcare[b]	Review of safety and health risks in HHC and recommendations for prevention strategies to eliminate injuries and illnesses. Provides checklists for both employers and workers. Accessible at http://www.cdc.gov/niosh/docs/2010-125.
Massachusetts Personal and Home Care Aide State Training program online training[c]	Online training curriculum includes: 1. Cleaning for clients with asthma and allergies, and 2. Fundamentals of home care Accessible at http://madirectcare.com/online-learning/.
Caring for Yourself While Caring for Others by NIOSH[d]	Available in handbook and 7-module training curriculum including trainer's guide, presentations, and participant handouts. Accessible at http://www.cdc.gov/niosh/docs/2015-102/default.html.

Abbreviations: HHC, home health care; NIOSH, National Institute for Occupational Safety and Health; OSH, occupational safety and health.
[a]See Gershon et al.[9]
[b]Refer to NIOSH Hazard Review: Occupational Hazards in Home Healthcare (no. 2010-125).[22]
[c]Refer to Massachusetts Personal and Home Care Aide State Training (PHCAST) program.[28]
[d]See National Institute for Occupational Safety and Health, DHHS (NIOSH) publication no. 2015-103.[29]

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ACKNOWLEDGMENTS

We are grateful to the home health care agencies, labor unions, public health professionals, and other participants who contributed to this study. A special thanks to all home care nurses, home care aides, and other home-based caregivers, who enrich many lives throughout the United States. Many thanks to the numerous Project SHARRP and Safe Home Care research team members who assisted with the data collection.

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