

# Technology Innovations for Better Fall Risk Management in Home Care

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## ABSTRACT

Achieving better fall risk management is an integral component of quality home care. The current qualitative study uncovers the challenges and opportunities of home health agencies (HHAs) in achieving better fall risk management. A secondary document analysis was adopted to learn from rich contextual information in fall incident reports recorded in a HHA. Poor engagement of patients and caregivers was a contributing factor in many fall incidents. Patients often fell as a result of not understanding or accepting their physical limitations. For better fall risk management, many incidents

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highlighted a need for providing complete and thorough care, better coordination of care, higher levels of sociocultural awareness, patient engagement, and caregiver involvement. The results provide evidence regarding the challenges and opportunities for improving fall risk management in home care along with insight about how information technology solutions can support improvement initiatives. [*Journal of Gerontological Nursing*, xx(x), xx-xx.]

**I**n the United States, *home health care*, also called home care, refers to intermittent and episodic second-

ary care services provided mostly to homebound older adults residing in their own homes by an interdisciplinary team of health care professionals supervised by physicians (Centers for Medicare & Medicaid Services [CMS], 2014). Home care includes skilled nursing, physical therapy, occupational therapy, speech therapy, social work, and assistance from home aides (Goldberg-Dey, Johnson, Pajerowski, Tanamor, & Ward, 2011). These services constitute an important part of the continuum of care (Fishman, Penrod, & Vladeck, 2003), supporting patients to gain strength, recover, and become independent

post-hospitalization (McNabney, Willging, Fried, & Durso, 2009).

Emergency care for injuries caused by a fall is the most frequently encountered potentially avoidable event observed during home care episodes (CMS, 2015). For older adults, falls lead to major health problems, increase health care costs, and can be fatal (Stevens, Corso, Finkelstein, & Miller, 2006). Unfortunately, home care patients, often frail and vulnerable during care episodes due to muscle weakness, gait problems, reduced vision, and cognitive impairments, reside in a care setting that is difficult to control without the constant supervision of clinicians (Ellenbecker, Samia, Cushman, & Alster, 2008).

Therefore, better fall risk management (i.e., taking preventive measures, reporting adverse events, and implementing targeted interventions [Pham et al., 2012]) becomes an integral component of quality home care and a top national priority for patient safety (The Joint Commission, 2016). Furthermore, the Value-Based Purchasing model in home care (National Association for Home Care and Hospice, 2015) makes fall risk management critical for home health agencies (HHAs) that want to improve their utilization outcomes (e.g., patients' emergency department visit rates) and reduce the risk of receiving payment penalties. HHAs can potentially achieve better fall risk management by learning from past experiences and understanding how to improve their existing processes (Koru, Alhuwail, & Rosati, 2015). Such an understanding also derives valid expectations, features, and requirements for information technology (IT)—a common enabler and facilitator of performance improvement initiatives—for better fall risk management (Alhuwail, Koru, & Mills, 2016).

To date, a systematic analysis of falls in home care using data from fall incident reports has not been re-

ported. The current study performed a detailed examination of the fall and near-fall incidents in a HHA to identify potential IT-based innovations that can be used in process improvement to achieve better fall risk management in home care.

## **METHOD**

Following Institutional Review Board approval, the study involved a detailed qualitative analysis of fall and near-fall incident reports recorded electronically at one HHA in the mid-Atlantic region of the United States. The HHA is part of a health care network comprising hospitals, physician practices, and rehabilitation centers. The dataset included 347 reports entered by HHA clinicians between 2010 and 2014. The reports were entered in an online fall incident reporting application. Each report included patient demographics, pre-fall incident measures, post-fall incident interventions, and a factual incident narrative providing explanations.

More than 400 pages of text narratives were analyzed using the Framework method, a qualitative analysis method similar to thematic analysis or qualitative content analysis (Ritchie & Lewis 2003; Smith & Firth, 2011). After data extraction, an initial conceptual index was created, guided by previously established key performance improvement domains in home care (Koru et al., 2015). Iteratively, data were labeled according to the index, sorted, and summarized. The index was improved and refined during this iterative process and major themes emerged. Thematic charts were developed for each major theme in the index, where the rows corresponded to the incidents and columns corresponded to the concepts within that major theme. This charting allowed researchers to summarize their understanding of the incidents in brief statements within the matrix cells and facilitated

comparisons made across incidents by visualizing similarities and differences. Consequently, after analyzing the themes, researchers developed a better understanding of the evidence and, as a result, typologies of incident reports emerged from the analysis.

## **RESULTS**

Six major themes were identified in the index.

### **Completeness and Thoroughness in Care Delivery**

Approximately one quarter of incidents indicated that no fall risk assessments were performed prior to the fall. In three incidents where the use of durable medical equipment (DME) was necessary, the DME orders were not placed or delayed. For example, a bedside commode was waiting at the physician's office to be installed for a patient, but it was installed only after the patient fell and a fall incident report was filed. Many reports repeatedly mentioned risk factors related to the physical environment where the patient lived (e.g., poor lighting, uneven surfaces, clutter in rooms) that contributed to the incident. These common and recurring patterns point to potential for significant performance improvement.

### **Patient Engagement**

In 14 (4%) cases, patients lacked information about using DME. In one incident, a patient fell while using his walker, but without wearing the appropriate shoes; the report indicated that he was not aware that proper non-slip footwear was essential. In another incident, a patient fell because he intentionally tried getting up from an arm chair without using his quad cane. The report acknowledged that the patient was not compliant with using the cane.

### **Caregiver Involvement**

In more than one half of incidents (>65%), family caregivers were

not present when the patient fell. For example, one caregiver left the patient without supervision to run errands and the patient fell while going to the kitchen to eat. In instances when caregivers were available, at times they insufficiently monitored patients. For instance, one patient fell after being left alone on the bathroom commode.

There were also opportunities to better inform caregivers about their own physical limitations in assisting patients. For instance, one older adult caregiver tried to assist her husband to transfer from the wheelchair, but he fell because she lacked the upper body strength to help him. In addition, providing more information to caregivers on the correct use and operation of DME could be beneficial to reduce falls. One caregiver did not know how to adjust the height of a tub transfer bench; the patient fell in the shower when the caregiver tried helping the patient get out.

### Expectations Management

Enhancing patients' understanding and acceptance of their own physical limitations could help reduce falls. One patient tried getting out of bed without assistance from the caregiver and without using an assistive device. Providing explanations to patients about the importance of seeking help, particularly when using DME, would be helpful. One patient fell from her walker because she thought she was able to hang clothes in the closet without assistance. Reports also indicated opportunities to educate caregivers about patients' physical abilities. In some instances, caregivers were overly optimistic about the patient's ability to ambulate. One caregiver was walking the patient out of the bathroom to the bedroom without using the walker; the caregiver thought the distance was short and that the patient could make it without using the walker. However, the patient collapsed halfway because she was too weak to walk this distance.

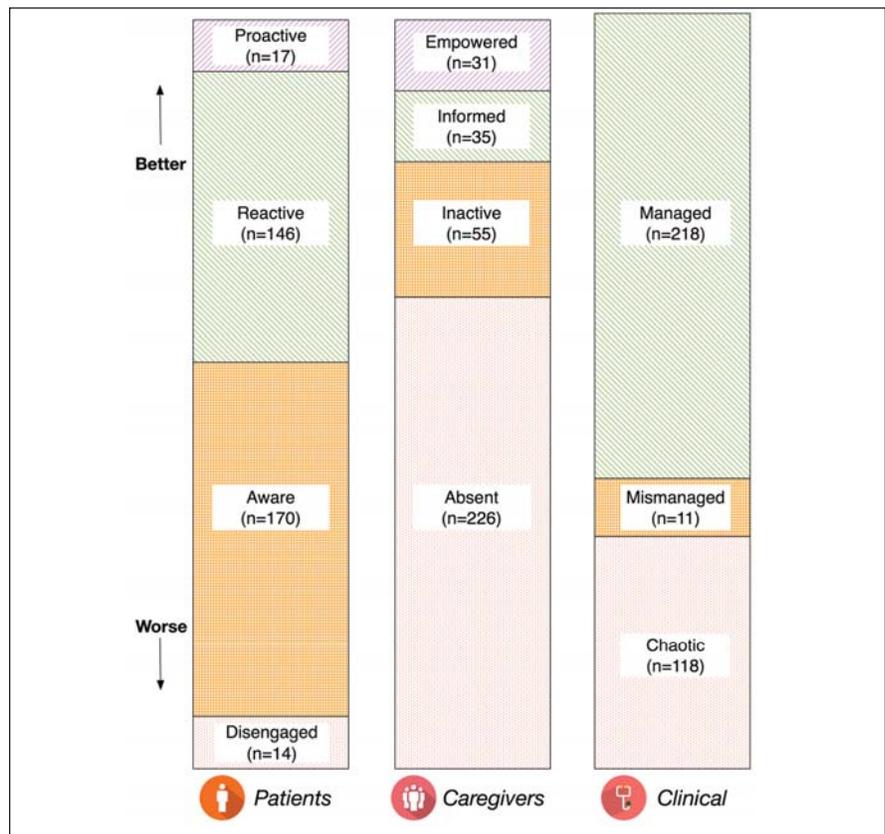


Figure. Typologies of the incident reports from three perspectives.

### Care Coordination

Some incidents indicated opportunities to improve the coordination and communication between the HHA and other care providers, such as referring hospitals or assisted living facilities. For example, one patient at an assisted living facility fell because staff did not communicate with clinicians about the patient's lack of adherence with using his wheelchair.

### Sociocultural Awareness

Knowing and understanding patients' cultures, customs, and religions could be useful in tailoring fall risk advice given to patients and caregivers. For example, one incident report indicated that the patient spoke Mandarin and the clinician feared that fall risk teaching was not well understood by the patient. Professional interpreter services could help better educate patients about fall risks.

### Fall Incident Typology

After following the analysis steps, researchers' high-level interpretation of the evidence resulted in the typologies of incident reports seen in the **Figure**. These typologies emerged from the information available in the incident reports. Each report was placed in distinct categories within each one of the three perspectives: patient, caregiver, or clinical.

*Patients.* In 14 (4%) incidents, patients were disengaged in fall risk management. These patients had cognitive impairments that prevented them from actively reducing their fall risks, and there were no indicators that the care plan was adjusted to account for diminished cognition. In approximately one half of incidents (49%), patients were aware of fall risks; however, they still did not follow the clinical advice or take the necessary measures. In many incidents (42%), patients were reactive; they took appropriate actions to

**TABLE**

**FALL RISK MANAGEMENT CHALLENGES AND POTENTIAL HEALTH INFORMATION TECHNOLOGY (IT) SOLUTIONS**

Identified Challenge	Potential Health IT Solution
Completeness and thoroughness in care delivery	<ul style="list-style-type: none"> <li>• Checklists embedded in electronic health record (EHR)</li> <li>• Integrating fall risk management data into EHR</li> </ul>
Care coordination	<ul style="list-style-type: none"> <li>• Health information exchange</li> <li>• Structured and standardized data</li> </ul>
Sociocultural awareness	<ul style="list-style-type: none"> <li>• Integrating information about social determinants of health into EHR</li> <li>• Smart translators (e.g., smartphones, head phones, EHR)</li> </ul>
Patient engagement and caregiver involvement	<ul style="list-style-type: none"> <li>• Patient portals</li> <li>• Smartphone apps</li> </ul>

reduce their fall risks, such as using the appropriate DME, only when they were instructed by clinicians. Few incidents (5%) indicated that patients were proactive, were aware of their health conditions, were accepting of their physical limitations, followed clinical advice (i.e., acquiring and using DME), and organized the home environment to be free of clutter. Yet, these patients fell due to their deteriorating health conditions.

*Caregivers.* In most incidents (65%), family caregivers were absent or unavailable to help the patient. In several incidents (16%), caregivers were inactive at home during the fall incident; they were not sufficiently attending to the patient's needs or they did not properly monitor the patient. Few reports (10%) indicated that caregivers were informed and willing to help patients and had enough knowledge to manage patients' conditions; yet, they were unable to effectively help patients and prevent falls, mostly due to their own physical limitations. Fewer incidents (9%) indicated that caregivers were empowered to manage patients' fall risks. In these incidents, caregivers were knowledgeable of health conditions, aware of fall reduction strategies, had the physical ability to help patients with activities of daily living, and continuously monitored patients' needs.

*Clinical.* In one third of incidents

(34%), the delivery of clinical care was chaotic. Fall risk assessments were not performed, and there was evidence of poor coordination with other stakeholders, such as referring providers and caregivers. Eleven (3%) incidents were characterized as being mismanaged because they indicated inefficient coordination with external stakeholders (e.g., assisted living facility staff) or clinicians did not thoroughly follow best practices, such as conducting physical exercise within the patient's body strength limits. Most incidents (63%), however, occurred even when the case was well managed by clinicians according to their existing procedures (i.e., taking all necessary steps to reduce falls, such as educating patients and caregivers, conducting fall risk assessments, and monitoring patients' vital signs throughout the visit and carefully documenting the incident after the fall).

**DISCUSSION**

Earlier studies reported that performance improvement in home care is more complicated than simply assessing whether certain clinical tasks were performed (Koru et al., 2015). Consistently completing fall risk assessments at the start of care for all patients could possibly reduce fall risks. However, merely capturing fall incident numbers is insufficient for performance improvement

(Maleyeff, Kaminsky, Jubinville, & Fenn, 2001). Performance improvement is often resource intensive and expensive (Chassin & Galvin, 1998). Health IT has shown potential to improve organizational performance and quality of care (Russell, Rosenfeld, Ames, & Rosati, 2010). However, health IT solutions need to be adopted to serve performance improvement targets effectively and efficiently.

**Potential Information Technology Solutions**

The **Table** highlights some of the potential IT solutions helpful to managing fall risk. The results also inform the requirements for IT-based fall risk management solutions by providing insights into the challenges and opportunities for improving fall risk management in home care. HHAs and health IT vendors can use this evidence to better understand the needs and challenges of home care patients and clinicians to develop more effective solutions for fall risk management.

*Enabling Better Workflows.* Standard fall risk assessment tools with internally developed checklists can be embedded in the electronic health record (EHR) to improve assessment of fall risk. Checklists have been found to be effective tools to improve patient safety in many care delivery settings (Hales & Pronovost, 2006)

and can also serve as useful tools to teach patients and caregivers about reducing fall risk (Huang, Lin, & Lin, 2008). In addition, integrating fall risk information into the EHR can enhance clinicians' vigilance in identifying at-risk patients earlier and more effectively.

*Orchestrating Information Flows.* Better sharing of information relevant to falls between the HHA and referring organizations prior to start of care would be beneficial (Alhuwail & Koru, 2016a). HHAs should investigate opportunities to participate in health information exchanges and partner with their referring organizations to share and exchange data electronically. Importantly, HHAs should ensure that data captured in their EHRs are structured and standardized using standards such as the Fast Healthcare Interoperability Resources standard.

*Sociocultural Integration.* Growing evidence supports the need to capture and present a set of standardized fields about social determinants of health in HHA EHRs (Gold et al., 2017; Gottlieb, Tobey, Cantor, Hessler, & Adler, 2016). In addition, artificial intelligence built into some smart devices (e.g., Siri® for iPhone®, Google Pixel Buds connected to Google Assistant for Android™) can help translate speech and communicate with patients speaking different languages. Although there is a lack of evidence regarding the efficacy and safety of using these new technologies and their embedded artificial intelligence, their future seems promising.

*Participatory Health Care Delivery.* The **Figure** shows that perhaps the greatest opportunity for better fall risk management lies in better patient and caregiver engagement. The results reveal opportunities to increase patients' awareness about the importance of adhering to clinical advice and complying with recommendations. Increasing patients' knowledge and awareness about managing falls would be beneficial

to reduce their risks. Recent studies reported that after being discharged from the hospital, many patients and caregivers do not have adequate understanding of fall risk management strategies (Hill et al., 2011). Therefore, it becomes important to empower and better engage patients by providing them with the necessary knowledge to manage their fall risk. Through leveraging IT tools, such as patient portals, clinicians could better provide information to increase the awareness of patients and caregivers about fall risk. Using patient portals and applications on smartphones could empower patients and their caregivers to self-report fall and near-fall incidents to HHA staff (Heyworth et al., 2014). These solutions can also be beneficial for improving the quality of care and reducing adverse events (Huerta et al., 2016). Through smartphone applications, caregivers can be informed of patients' progress and conveniently communicate with clinicians to seek advice or further instructions to perform certain exercises with the patient after the visit (Alhuwail & Koru, 2016b). In addition, HHAs can provide relevant training and information about the importance of keeping the home free of clutter or medication side effects and how they can impact fall risk. Finally, the recently emerging artificial intelligence technologies involving digital voice and sensors that can detect changes in gait and near falls can potentially prevent falls by providing timely information to clinicians and caregivers (O'Connor, Phillips, Folarinde, Alexander, & Rantz, 2017).

## LIMITATIONS

There is an inherent limitation to the current study. Although incident reports provided highly relevant and rich qualitative data, reports were entered by clinicians. The perspectives of patients and caregivers related to fall incidents were not captured.

## CONCLUSION

Overall, the results provide data about fall risk management in home care. Health IT solutions are suggested that can be used to respond to the challenges and opportunities identified in the current study to positively impact fall risk management in home care. Future studies should test these proposed IT interventions and ways to effectively and efficiently engage caregivers of home care patients to achieve better fall risk management. Certainly, the findings of this study about better managing fall risks via technology need to be considered along with the current paradigm shift in falls reduction, which focuses on mobilizing older adults rather than only reducing falls (Growdon, Shorr, & Inouye, 2017).

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